Responses to Science Review Panel Comments

Giant Sequoia National Monument DEIS and Plan

#	SRP Comment	Location of Response in DEIS, Draft Plan, or Other Documents	FS Response
1	Malcolm North, pp. II-3 and II-4: “What are the criteria that will be used to make large tree thinning decisions? On what science will those criteria be based?” (and) “What’s lacking in the report is a clarification of the science that will be used to decide where and why large trees are thinned, and how these different treatments will help restore the forest ecosystem at the landscape level.”	Volume I--Chapter 4--Effects on Vegetation, Including Giant Sequoia Groves--Indirect Effects—Effects of Alternatives and Climate on Forest Ecological Restoration and Resiliency—Scientific Criteria for Thinning	Resiliency will be a major criterion in determining thinning needs. The addendum to the North et al. (2009) report provides a good literature summary of the principles of improving forest resiliency. This report (North et al. 2009) discusses reducing fuels, limiting insects, and reducing tree moisture stress by reducing stand density and improving per tree water availability. It (North et al. 2009) goes on to discuss the need to remove 20- to 30-inch trees when overly dense stands are moisture stressed. Removal of a portion of trees that are greater than 20 inches may be needed for ecological restoration or safety. A removal of some larger trees that would help make suppression of unwanted fire more effective and safe (Moghaddas and Craggs 2007) may qualify under both criteria (ecological restoration or safety) for removal. Larger trees would not be cut for the sole purpose of applying retardant. Some overstocked stands in the Monument cannot be properly thinned for resiliency without removing some trees over 20 inches. In other words, simply removing smaller trees from the understory of a mature forest may have little significance in enhancing moisture and nutrients needed by larger trees. In stands that are more open, treating low ground vegetation, including smaller trees, may, however, have a beneficial effect on the larger trees (York et al. 2010). In stands with a mixture of undesired dense vegetation in the understory and in the main canopy, reducing this vegetation can greatly increase soil moisture available to the remaining trees and increase growth on the larger trees. In a study with southern pine on 40 different sites by Hanna et al. (2000), removing forbs, shrubs, and undesired trees increased soil moisture from 9.6 to 14.5 percent in the upper 6 inches, from 19.8 to 24.7 percent in the 6- to 12-inch soil zone, and from 22.9 to 24.8 percent in the 12- to 24-inch zone. This soil moisture increase reduced stress and increased crown biomass and leaf area in the upper foliage of main canopy trees. A 17 percent increase in soil moisture corresponded to an 8 percent increase in leaf water potential (reduced stress)

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			during the hottest and driest time of the year. In addition, field measured leaf area increased 30 percent, and crown foliar biomass increased 27 percent over untreated controls. Smaller trees in the stand showed less response. The larger trees responded to this increase in soil moisture, foliage, and leaf water potential with a 20 percent increase in diameter within two years. This same amplitude and quickness of response may not necessarily happen in forests within the Monument, but the principles of allocating available water to fewer, more desirable trees are universal. The principles of more rapid and greater responses in larger trees that are the same age as smaller trees is also universal. In the same study (Hanna et al. 2000), a test was performed to determine the effects of an enhanced foliar biomass and a suppressed root system (through nitrogen fertilization) without vegetation control. Trees that appeared most vigorous in leaf area displayed higher mortality during the extreme drought conditions. McDowell et al. (2008) made similar observations during drought. This simulates, in part, the principles of the “boom and bust” phenomena that could be expected in the Monument where moist cycles are followed by hot dry cycles. It also supports the concept of determining a desired stocking level that is below the site capacity for long-term tree and stand resilience. Currently, many thousands of acres of forest stands are above a desired stocking level in the Monument based on soil and other site conditions, and it is only a matter of time until there is a dramatic increases in insect, disease, and fire mortality in young and old stands, including stands with trees over 20 inches in diameter. Once this happens, it will generally be too late to accomplish stand resilience. Considering site conditions at a project level is key to understanding the ecological benefits. Planning for the Monument should be flexible enough to allow changes as site conditions and tree health change. For this draft EIS, criteria will often be general in order to allow for many different conditions, high site variability, and changes in time. Tree removal for understory fuels management will generally be easy to measure, but removal for ecological restoration will vary greatly depending on the site. Ranges of tree removal will be guided by strategies referring to acceptable or desirable canopy cover and basal area reductions. Projects that flow from this planning effort will require fieldwork and preparation of silvicultural

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			prescriptions for each stand. At that time, environmental conditions, stand density, tree sizes, and trends will be evaluated. Larger trees will be favored for retention. Occasionally, a large tree could be removed to favor another tree that is more desirable in terms of condition, structure, or species as specified in a project objective. Where the main forest canopy is dominated by trees larger than 20 inches in diameter and stand density is observed to be higher than suggested for that site to retain resiliency, thinning of main canopy trees may be prescribed to protect the stand from drought, insects, disease, and wildfire. This thinning will focus on protecting and maximizing diameters on the remaining trees. In many cases, this treatment will increase the number or size of trees that fall into the large tree category. Ecosystem science that considers the site capacity, climate, and species physiology is the main basis of forest stand stocking charts that will serve as a major basis for silvicultural diagnoses and prescriptions. Adjustments may be made to prescriptions as changing conditions are observed. Scientific experiments that are designed to demonstrate tree growth responses to changing conditions will be essential in providing the guidance needed for field silviculturists to better design treatments to meet objectives.
2	Malcolm North, p. II-3: "…the assumption that groups of large trees will respond to increased density with reduced growth and increased stress… has been clearly demonstrated in scores of silvicultural studies. Most of these studies, however, are on smaller size trees and often in controlled settings (i.e., plantations where density can be directly manipulated). Will large trees in the Sierra respond	Volume I--Chapter 4--Effects on Vegetation, Including Giant Sequoia Groves--Indirect Effects—Effects of Alternatives and Climate on Forest Ecological Restoration and Resiliency—Forest Stand Structure, Individual Tree Vigor, Density, and Resilience	The size of a tree is just one factor among many to consider. It is not a direct factor, but one that relates to more important factors such as access to water, nutrients, and sunlight. Discussions in the previous sections partially address this question. It is well-known to many silviculturists across the nation that given similar age, genetics, and environmental factors, larger trees generally respond better than smaller trees. This is true with both hardwoods and conifers. It is easily explained in principles of tree physiology and has been a fundamental principle behind intermediate and regeneration silvicultural techniques for decades. Much past removal of the largest and presumably the oldest trees in the Pacific Northwest was done under the general assumption that these trees had reached critical limits in age. Crowns of older giants were often declining. In trees with numerous internal vessel embolisms that reduced water uptake, whether in Douglas-fir in Oregon or red oaks in North Carolina, positive growth responses to weather extremes or disturbances were greatly reduced. On a large-scale program on the Umpqua National Forest in Oregon in the late 1970s, larger trees, regardless of physiological condition, were targeted for removal even though many may have lived hundreds of years longer. Providing favorable growth conditions for larger trees that are in good health will not only enhance

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	the same way?”		their growth more than smaller trees, but may allow those larger trees to live longer. Increased vigor of larger, older trees as a response to thinning has been observed in Douglas-fir (Newton and Cole 1987) and ponderosa pine (McDowell et al. 2003). Numerous observations have found the large giant sequoia trees often respond to disturbances regardless of age. This is evident in tree ring analyses and has been demonstrated in field tests. York et al. (2010) observed that older sequoias and white fir displayed growth enhancements for 10 years after gap creation and removal of vegetative competition. They concluded that management activities which reduce adjacent vegetation can increase the vigor of very large and old giant sequoias (Roller 2004). One cannot assume that larger trees will respond the same as small trees. While each tree may be faced with increased stress due to higher heat and more competition for moisture and nutrients, a tree with a larger root system will have access to more volume to draw from. On the other hand, a tree with a smaller leaf area will have a reduced requirement for moisture and nutrients. In many cases a larger tree that has reached its peak height may have also reached its peak leaf area within a given stand structure and climate. A root system that has been balanced over the decades with the variable demands of leaf area and has access to deeper soil or lithic (rock-based) water may easily weather several years of drought while smaller trees with roots in less deep soil may die within a few years during a normal drought. In an extended drought or a climate changing to warmer temperatures, snow depths are reduced or lost early and soil water is often not replenished. Deep, lithic water, which is dependent on water that infiltrates and percolates in a vertical plane or water that flows parallel to rock strata will also be reduced. It may take longer for deeper rooted trees to suffer from droughts. In the mixed conifer communities of the Monument, it is common to observe pines with roots that follow deeply into fractured granitic rock. Blue oaks can be found in the middle of dry meadows with a root system almost entirely within a few major cracks in bedrock. Valley oaks often have very long root systems in this oak zone that extend to subsurface water. These phreatophytic or deeply rooted plants can reach large diameters when all other trees are stunted by short growing seasons.

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			In 2008, after several years of drought large, old valley oaks in the Monument could be found highly stressed or dead due to reduced groundwater flow from higher elevations. Without site-specific investigation and experienced observations, a field person would not know exactly how much or where this occurs. On a programmatic basis, the treatment responses of tree by size would be somewhat inconclusive. However, on a project level basis, there may often be enough evidence of moisture stress to prepare guidelines to select featured trees by phenotypic or visible features, such as crown dimensions, growth rate, canopy class, and other factors, to consider in promoting the best habitat for protecting remaining trees and for maintaining or promoting resiliency to withstand further drought, insects, and diseases. As a general statement, a larger tree that displays a sustained accumulation of stem growth over the decades would be favored for survival over a smaller tree of the same age. Smaller trees that are younger may currently be healthier, but may not necessarily be retained in a prescription designed to favor the longer-term maintenance or restoration of forests with larger trees. In many cases with bark beetles (*Dendroctanous spp*.), larger trees are the first victims in outbreaks. Larger trees that are growing vigorously, however, may survive several years of bark beetle attacks. It is evident in the field, that given two larger trees that are the same size, the younger tree is often more resistant to bark beetle attacks. The major challenges faced in managing multiple species of trees on many different types of sites, along with the many biotic and abiotic factors that work in ways ranging from synergistic to antagonistic continue to make silviculture both a science and an art. It is a science that will continue to rely on local research and sound tested principles of plant and soil relationships. It is an art where experienced field silviculturists design a prescription that observes the past and present, yet predicts into the future while considering the type and severity of risks involved. When faced with a lack of quantitative research to indicate exactly how to treat a particular forest ecosystem, a silviculturist falls back on the basic scientific principles of providing growing space, structure, and species selection, in prescribing how to best protect a stand of trees. Special precaution should be taken when preparing program level standards, especially for highly complex and changing conditions

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			related to managing forest ecosystems. There is a trend to prepare simplistic standards to cover all environmental concerns against taking an action. These standards are often unduly restrictive. A more general set of standards responding to issues such as climate change will focus on the need for flexibility and versatility in treatments. It is not known what intensity of treatments will be required. If they were known, it would be a stand-by-stand or ecosystem-by-ecosystem level analysis. These types of analyses, as stated above, will be addressed at the project level.
3	Malcolm North, pp. II-4 to II-5: “There are two nice studies suggesting optimal light environments and gap size for giant sequoia (York et al. 2003, 2008) that might be useful to discuss and cite.”	Volume I--Chapter 4--Effects on Vegetation, Including Giant Sequoia Groves--Indirect Effects—Effects of Alternatives and Climate on Forest Ecological Restoration and Resiliency—Effects of Alternatives on Giant Sequoia Regeneration	Research has been done over the past several years to help determine the effects of gap size for the regeneration of sequoia and other species. Since gap edge tree height is correlated to light interception, the testing of tree response to the creation of openings in the forest canopy intentionally or unintentionally tests gap size by quantity and quality of solar radiation. It should be kept in mind that other factors such as aspect, steepness, and shape of openings should be considered before an investigator can understand the effects of edge trees in determining how large an opening should be to establish regeneration and expect acceptable growth. The findings of York et al. (2003) are consistent with well-established research on gap size in forest ecosystems across the nation. Small gaps may not provide enough light for shade intolerant species. They found that giant sequoia seedlings compared to other tree seedlings responded best to increases in light. The study also observed that there was an overall 34 percent increase in mean tree heights where there was a 1,000 percent increase in opening size. This, of course, is dependent on the initial gap size and does not determine the limiting or the most favorable gap size to use. For small gap or group sizes less than 2 acres, the study demonstrated that ample light was lacking in south portions of the opening for trees that need more light for growth, mainly sequoia and pines. Stephenson (1999) described heterogeneity as a logical product of past periodic fire events that were often small and patchy. Bonnicksen and Stone (1982) concluded that this heterogeneity may not be easy to accomplish with just fire since fuel accumulations have been widespread and uniform. The best answer may lie somewhere in between where some mechanical restoration will help accomplish structural heterogeneity while more safely reintroducing fire and encouraging small patches of shade intolerant species to regenerate.

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			The assessment of a site-specific factor such as existing edge tree height in determining size of gap, as described in the vegetation section of the DEIS, has proven to be a valuable standard to begin from in both research and field application. York et al. (2004), in the same study as York et al. (2003), found that height growth suppression was greatly reduced in openings greater than about 1.5 acres where the opening diameter was 2.6 times the height of the edge trees. The increases in growth rates due to increases in opening sizes were not linear. York at al. (2009) found that growth rates of young giant sequoia seedlings increased rapidly when openings were increased from 0.1 acres to 0.5 acres. The rate of increase was less in openings from 0.5 to 1 acre in size. None of the above studies were designed to determine the optimal opening size, but silvicultural designs where opening widths are at least twice the edge tree heights provide a basis to start from that is directly related to the quantity of sunlight and easy to measure in the field. In many forest types across the country, growth of shade intolerant trees can be expected to benefit from increases in sunlight, and in some instances the growth may parallel to that found in larger openings characteristic of the more natural and efficient even-aged management. The edge trees in the York et al. (2003, 2004) studies were 90 years old. In the Monument, ages of potential edge forest trees may range from younger than 90 years to several thousand years. Larger and older sequoias on highly productive sites may reach well over 250 feet in height. They may be scattered or in groups. Their crowns may allow direct light to penetrate, or they may block most direct light. Larger pines may be well over 160 feet in height and may be located between sequoias or in uniform patches. Designing openings that provide just the right amount of light for desired species will require site-specific evaluations in order to determine size, shape, location, vegetation and fuels treatment needs, and other factors that affect the survival and growth of desired tree seedlings. In the Monument, it is anticipated that up to 10 percent of tree planting mixes will include sugar pine, a major species in mixed conifer communities, including giant sequoia groves, that is threatened by the blister rust disease. In order to better manage this species, it will be important to assure ample sunlight in gaps where sugar pine is desired. This will help

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			assure favorable growth and improve resistance to drought, bark beetles, and other factors in addition to the threat that blister rust poses in managing this species. Larger openings in the upper canopy will provide conditions that sequoia and pines need to keep up with or outgrow shrubs, white fir, and incense cedar. Planting or managing for natural regeneration of these shade intolerant species by grouping them in north and central portions of the gap would provide not only a more favorable environment, but would accomplish a heterogeneous distribution favorable for certain ecological, silvicultural, and wildlife objectives. The determination of optimal growth rates in the Monument when working with trees less tolerant of shade is not necessarily to attain the fastest height growth, but to attain a reasonably healthy tree or group of trees. In particular, the leaf system should be adequate to capture enough sunlight to develop a corresponding stem and root system. The root system should be adequate to capture soil moisture, which is often limited in the summer and during droughts. In addition, the main stem should grow large enough with thick enough bark to escape periodic and more frequent fires that may be used for fuels and vegetation management.
4	Malcolm North, p. II-5: "I think acknowledging that some researchers, particularly from the Pacific Northwest, have suggested fuels reduction treatments are a net carbon loss could strengthen the section (Meigs et al. 2009, Mitchell et al. 2009)… could note that even in the latest PNW paper (Mitchell et al. 2009), a careful reading indicates the authors believe fuels	Volume I--Chapter 4--Effects on Vegetation, Including Giant Sequoia Groves--Indirect Effects—Effects of Alternatives and Climate on Forest Ecological Restoration and Resiliency—Effects of Alternatives on Carbon Sequestration	There is controversy and uncertainty over the best means of carbon sequestration in fire prone ecosystems. This section focuses mainly on Mediterranean forest ecosystems which are prone to fires, especially during or after hot, dry summers. The principles applied to these systems may apply to other ecosystems across the country, but in certain mesic ecosystems, such as found in the higher rainfall areas of the Pacific Northwest, fuels reduction projects may currently be a net carbon loss (Meigs et al. 2009, Mitchell et al. 2009). Hudiburg et al. (2009), suggested leaving as many trees on a site as possible to sequester the most carbon. As previously explained, the concepts of carbon sequestration are time dependent. Smaller plant biomass may not be sequestered, while larger roots and the relatively non-metabolizing xylem of longer living trees can easily qualify as sequestration. Thus, merely packing more trees on a site will not necessarily enhance sequestration. The most effective way under various climate regimes will be to reallocate carbohydrates to larger, fewer structures such as larger trees which are more resistant to fire.

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	treatments may benefit carbon dynamics in the one frequent fire forest type they studied, eastern Oregon ponderosa pine. In short, the report accurately summarizes the most relevant literature but it should note there is controversy and uncertainty over the best means of carbon sequestration in fire prone systems. I would also suggest citing the concept of carbon carrying capacity (Keith et al. 2009), the potential carbon mass stored under prevailing environmental conditions and natural disturbance regimes."		In western forests, increasing the stand density or allowing stands to remain fully stocked for the purpose of carbon sequestration will not be responsive to the need to enhance or maintain resiliency and resistance to fire. The size, frequency, and intensity of wildfires in these forests including the more moist forests may be greatly accelerated under a warmer climate with drier summers. Thus, fuels reduction treatments may appear to be a lower priority to managers who are used to the more moist sites, but the increased amount of fuels on these sites will prove to be a high risk during times of extreme weather. One major controversy surrounding the issue today is between those who want to wait until the forests are high risk and those who want to reduce stand densities today. Recent increases in fire size and intensity have proven that failure to plan ahead assures a net release of carbon to the atmosphere and more limits the response to the situation to dead tree salvage and artificial planting.
5	Malcolm North, p. II-5: "The material on forest resilience and restoration is accurate but rather than defining them seems to equate the two. This, however, is not so much a fault of the report, but due at least in part to a lack of	Volume I--Chapter 4--Effects on Vegetation, Including Giant Sequoia Groves--Indirect Effects—Effects of Alternatives and Climate on Forest	Ecological restoration in many cases will consider the conditions of the major vegetation in an ecosystem. In forested ecosystems, restoration will pay close attention to fuels and tree density. Ecological restoration may be accomplished or partially accomplished through the reduction of fuels, and in some cases restoration or resiliency treatments may be equal to the fuels treatment. The current (04/16/2010) U.S. Forest Service theme for restoration in Region 5 states: • We are focusing our work on restoration actions so that all forests and wildlands are better able to adjust and thrive in the face of climate change and large scale

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	consensus in the scientific literature on how these concepts should be defined."	Ecological Restoration and Resiliency—Defining Restoration	disturbances such as fire, drought and insect and disease attacks. • All plans, projects, and activities conducted in the Region that affect the ecosystem will be consistent with and driven by restoration needs. In addition, the agency Leadership Intent (based on Forest Service Manual 2020, and the vision statements, August 14, 2009, by USDA Secretary Vilsack for America's forests) state: Our goal for Region 5, (California, Hawaii and the Pacific Islands), is to retain and reestablish ecological resilience of these lands to achieve sustainable management on our wildlands and forests and provide a broad range of ecosystem services. Ecologically healthy and resilient landscapes will have greater capacity to survive natural disturbances and large scale threats to sustainability, especially under changing and uncertain future environmental conditions, such as those driven by climate change and increasing human use. This document also defines "Ecological Restoration" as: The process of assisting the recovery of resilience and adaptive capacity of ecosystems that have been degraded, damaged, or destroyed. Restoration focuses on establishing the composition, structure, pattern, hydrologic function and ecological processes necessary to make terrestrial and aquatic ecosystems sustainable, resilient, and healthy under current and future conditions. (Forest Service Manual [FSM] 2020). The terms sustainable, resilient, and healthy are often synonymous in managing for healthy forests and are also the main focus of restoration. Although restoration and resiliency are not always equal, the most important issue in the Clinton proclamation is to protect the objects of interest. This proclamation equates the current fuels buildup in forest ecosystems as a fire hazard that did not exist when stands were less dense and were subject to periodic lower intensity fires. Attempts to protect forest ecosystems from drought, insects, and disease can and may be done simultaneously when possible. Given the small percentage of acreage that is projected for vegetation treatments in any given year, it will be necessary to combine projects as much as possible to

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			accomplish overall desired conditions.
6	Malcolm North, p. II-5: “What would strengthen the section is some discussion that restoration does not mean a return to past conditions but an effort to make forest ecosystems more resistant to dramatic change and resilient to disturbance and climate change.”	Volume I--Chapter 4--Effects on Vegetation, Including Giant Sequoia Groves--Indirect Effects—Effects of Alternatives and Climate on Forest Ecological Restoration and Resiliency—Defining Restoration	Restoration is not the same as returning to past conditions. In an effort to promote or maintain resilience, restoration treatments will consider the advantages of certain past conditions such as reduced surface and ladder fuels and more open stands with larger trees. Restoration, however, acknowledges that some past conditions are not applicable or attainable, and attempts to return to some conditions could be inappropriate.
7	Kevin O’Hara, p. II-8: “A key issue for the GSNM is the regeneration of the namesake species. Size of openings or gaps is a critical element to success of shade intolerant conifers such as giant sequoia as well as sugar pine and ponderosa pine. In poorer light environments, shade tolerant conifers become more competitive. Highly applicable work on opening size and effect of opening size on growth rates has not	Volume I--Chapter 4--Effects on Vegetation, Including Giant Sequoia Groves--Indirect Effects—Effects of Alternatives and Climate on Forest Ecological Restoration and Resiliency—Effects of Alternatives on Giant Sequoia Regeneration	Research has been done over the past several years to help determine the effects of gap size for the regeneration of sequoia and other species. Since gap edge tree height is correlated to light interception, the testing of tree response to the creation of openings in the forest canopy intentionally or unintentionally tests gap size by quantity and quality of solar radiation. It should be kept in mind that other factors such as aspect, steepness, and shape of openings should be considered before an investigator can understand the effects of edge trees in determining how large an opening should be to establish regeneration and expect acceptable growth. The findings of York et al. (2003) are consistent with well-established research on gap size in forest ecosystems across the nation. Small gaps may not provide enough light for shade intolerant species. They found that giant sequoia seedlings compared to other tree seedlings responded best to increases in light. The study also observed that there was an overall 34 percent increase in mean tree heights where there was a 1,000 percent increase in opening size. This, of course, is dependent on the initial gap size and does not determine the limiting or the most favorable gap size to use. For small gap or group sizes less than 2 acres, the study demonstrated that ample light was lacking in south portions of the opening for trees

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8	Kevin O'Hara, p. II-8: "Management of affected ecosystems should address the plight of sugar pine and the need to maintain this species and a broad genetic base for future adaptation. The supporting science for this should include the symposium proceedings edited by Kinloch et al. (1996)."	Volume I--Chapter 4--Effects on Vegetation, Including Giant Sequoia Groves--Indirect Effects—Effects of Alternatives and Climate on Forest Ecological Restoration and Resiliency—Effects of Alternatives on Giant Sequoia Regeneration	In the Monument, it is anticipated that up to 10 percent of tree planting mixes will include sugar pine, a major species in mixed conifer communities, including giant sequoia groves, that is threatened by the blister rust disease. In order to better manage this species, it will be important to assure ample sunlight in gaps where sugar pine is desired. This will help assure favorable growth and improve resistance to drought, bark beetles, and other factors in addition to the threat that blister rust poses in managing this species. Larger openings in the upper canopy will provide conditions that sequoia and pines need to keep up with or outgrow shrubs, white fir, and incense cedar. Planting or managing for natural regeneration of these shade intolerant species by grouping them in north and central portions of the gap would provide not only a more favorable environment, but would accomplish a heterogeneous distribution favorable for certain ecological, silvicultural, and wildlife objectives.
9	Kevin O'Hara, p. II-9: "Although I agree that the general direction of density management on the GSNM is appropriate, there should be	Volume I--Chapter 4--Effects on Vegetation, Including Giant Sequoia Groves--	An increase in growing space will increase canopy openings until that space is filled again by crowns of remaining trees. Increased growing space accomplishes at least two important objectives in restoring stands in the Monument. The first effect will be reduced transpiration of leaf area which will help conserve soil moisture. The second effect will be a redistribution of growth onto fewer trees. Peracca and O'Hara (2008) demonstrated in a

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	both more specificity in describing density regimes and use of the literature to justify proposed density regimes.”	Indirect Effects—Effects of Alternatives and Climate on Forest Ecological Restoration and Resiliency—Forest Stand Structure, Individual Tree Vigor, Density, and Resilience	study with giant sequoia and pines that volume growth and biomass per tree increased, whereas stand volume and stand biomass decreased with increased growing space. O’Hara and Valappil (1999) proposed using the multi-aged stocking assessment model (MASAM) to take into account differential growth rates depending on relative canopy position and maximum growing space occupancy based on leaf area. The model provides estimates of stand growth and average tree vigor. In project application, “the user would design the desired stand structure by selecting the maximum total level of growing space occupancy, the number of components and how growing space is allocated among these components.” The leaf area approach, when properly developed, can provide guidance in allocations to tree age classes, species, and canopy layers desired for restoration and wildlife habitat. O’Hara and Gersonde (2004) described general approaches to stocking control within stands of variable sizes. Whereas stocking control in even-aged/even-sized stands has a long history of applications such as stand density index and smooth tree size versus tree quantity relationships, these are not so well-defined or researched in uneven-sized stands of trees. The authors suggest factors such as leaf area may be useful in determining growth allocation by size classes in the heterogeneous stands of the Monument. They explain that this approach uses features that are directly related to productivity and growing space rather than focusing on diameter distributions and structures. Gersonde and O’Hara (2005) observed that using leaf area, estimated in part through measuring stem xylem sapwood area, to describe the effect of local light environment on growth efficiency helped quantify competitive relationships between trees in different canopy layers. This was in large part due to the ability of the assessment to account for differences in estimated leaf area between trees and the amount of absorbed light. Leaf area and root system structures are key factors in assessing resilience, which, not excluding fuels loading, is the most important element of restoration in the Monument. Root system assessments have historically been difficult and time-consuming for stand management projects. Forest stands that have developed under a stable nutrient regime,

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			especially in terms of available soil nitrogen, have developed root systems over time that correspond proportionally to the crown leaf structures (Hanna unpublished). Where root system suppression from added nitrogen is not suspected, there is little reason to take the extra efforts to excavate subsurface features; thus in general, field measures of growth efficiency rely on aboveground structures such as tree stems at an accessible level. Measurements or estimates of leaf area provide one approach to developing project level prescriptions that would help field professionals determine the appropriate level of stocking, including species, structures, and distribution. On a large-scale basis, the methods employed by the researchers above would measure variables normally measured in silvicultural field exams such as crown dimensions, heights, diameters, etc. There are many ways to estimate leaf area, but each method designed to manipulate structure will require the field examiner to differentiate between species, canopy position, and other common stand exam data. Using a method that correlates sapwood area to leaf area (Waring et al. 1982) may actually be considered a stand diameter or basal area approach. Consideration, however, should be given to measurements not usually taken in silvicultural exams such as species photosynthetic efficiency and stem taper above the lowest limbs in the crown. McDowell et al. (2002) found that the leaf to sapwood area ratio varied by tree height. As Douglas-fir grew in height, the ratio decreased, but as balsam fir grew in height, the ratio increased. The authors had no explanation, but shade tolerance and crown ratio may have been a factor. Even direct leaf area estimates, if done, are not always the best; they can be misleading. Leaf area in coniferous and hardwood ecosystems can vary greatly within a year or between years subjected to different amounts of precipitation or nutrition (Hanna 2000). To be most efficient the leaf area approach will need to adapt various species stocking tables developed for even-aged management to help better estimate a maximum desired leaf area for stand restoration and resilience. In some cases, using standard techniques that rely more on tree size and number of trees may be the best approach. While it may appear that radial cores that display diameter incremental growth can provide the best growth estimate over a long period of time, it should also be kept in mind that this expression of growth is time, climate,

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			and competition dependent. Regardless of the method, field marking guides will need to consider all major factors that determine growth efficiency and transpiration of individuals and groups of trees in the past, present, and projected future environments. In order to establish the clear need for removing trees, as set out by the Clinton proclamation, each individual forest stand or forest ecosystem should be evaluated in the field considering the major objectives for the project. For all projects within the Monument, there will be a determination to establish if the treatment is "clearly needed for ecological restoration and maintenance or public safety."
10	Kevin O'Hara, p. II-10: "Carbon sequestration in forest ecosystems is often assumed to parallel biomass accumulation. There is also a general assumption that greater densities in the post-fire suppression period have resulted in greater carbon accumulation in these ecosystems."	Volume I--Chapter 4--Effects on Vegetation, Including Giant Sequoia Groves--Indirect Effects—Effects of Alternatives and Climate on Forest Ecological Restoration and Resiliency—Effects of Alternatives on Carbon Sequestration	Carbon sequestration is described in terms of time and type of forest structures. The general accumulation of biomass may or may not indicate a certain quantity of sequestration. Biomass accumulation may indicate conditions related to overly dense stands where full site utilization and the metabolic products related to that growth display a higher amount of respiration of carbon dioxide and a higher potential of sudden losses of carbon to the atmosphere due to oxidation in fires. The potential for sequestration for at least 100 years can be summarized from the vegetation sections as follows: 1. development and conservation of larger, live, sound trees that contain large stores of slowly metabolizing carbon-based structures and are resistant to fire, including fire scars 2. the recalcitrant soil organic matter fraction, when managed for protection from fire, represents a major storage sink for carbon 3. wood utilization for structures or other wood products with a long-term use 4. substitution of wood energy from the Monument for fossil fuels
11	Kevin O'Hara, p. II-10: "The paucity of giant sequoia regeneration in the GSNM and throughout the sequoia range is identified as a critical issue and the 'continued existence of this species' is central to the Clinton proclamation creating the GSNM. However, I did not	Volume I—Chapter 3—Vegetation, including Giant Sequoia Groves--Giant Sequoia Ecology Overview—Giant Sequoia Regeneration	Some research has suggested that most groves today lack sufficient young giant sequoias to maintain the present density of mature trees in the future. Rundel (1971) speculated that giant sequoia regeneration has been declining over a period of 100 to 500 years or more. Given the longevity of the species, the tendency to grow best in disturbances, and the frequency of droughts, it is not likely that sequoia regeneration would follow a smooth pattern of frequent successful seedling establishment. It is likely that sequoia regenerates only during certain years when the site conditions and soil moisture are optimal. Schubert (1962) recognized that to support the establishment of a young sequoia moisture was critical throughout the growing season.

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	see discussion of the urgency of this need given the longevity of the species…The uncertainty and urgency of sequoia regeneration may therefore be over-stated.”		Young sequoias must grow large enough to survive the effects of fires, especially when human-caused fires are more frequent than natural fires sparked by lightning. It is also likely that one or more decades are required between burning to enable a young sequoia to grow large enough to withstand the heat at the base of the stem. Sporadic regeneration of the species in clusters of a few trees or small even-aged patches up to an acre is more an ecological trait and an adaptation to periodic fires than an environmental concern. Even-aged cohorts greater than an acre are rare, but may be found as a result of past stand replacement events like a wildfire or mechanical harvest. The greatest concern in most sequoia ecosystems is not sequoia regeneration, but the heavy buildup of surface and ladder fuels which could do serious damage to existing larger trees and the soil resources that support the giant sequoia. Associated with this is the abundant ingrowth of white fir and incense cedar. These species are more tolerant of shade. They reduce the growth of other tree species by using soil moisture and casting shade. They also serve as ladder fuels which could damage or kill the crowns of the largest trees. Sugar pine may be the species of greatest concern. More attention needs to be placed on the artificial regeneration of more rust-resistant sugar pine to help assure its important role in mixed conifer ecosystems, including giant sequoia groves.
12	Kevin O’Hara, p. II-10: “The maintenance of sugar pine in these Sierra Nevada ecosystems may be a more critical problem than maintenance of giant sequoia.”	Volume I—Chapter 3—Vegetation, including Giant Sequoia Groves--Giant Sequoia Ecology Overview—Giant Sequoia Regeneration	The greatest concern in most sequoia ecosystems is not sequoia regeneration, but the heavy buildup of surface and ladder fuels which could do serious damage to existing larger trees and the soil resources that support the giant sequoia. Associated with this is the abundant ingrowth of white fir and incense cedar. These species are more tolerant of shade. They reduce the growth of other tree species by using soil moisture and casting shade. They also serve as ladder fuels which could damage or kill the crowns of the largest trees. Sugar pine may be the species of greatest concern. More attention needs to be placed on the artificial regeneration of more rust-resistant sugar pine to help assure its important role in mixed conifer ecosystems, including giant sequoia groves.
13	Keith Reynolds, p. II-16: “It will be important to develop a companion document that provides a clear	Volume II—Appendix J, Multi-Criteria Decision Support	An entire Background section has been developed for the MCDS model/decision support website which will be offered to the public again upon release of the draft EIS and management plan. This Background section is one of the main links from the home page of the website and gives information on the MCDS process, how it is used in this website

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	rationale for each rating [in the MCDS (Multi-Criteria Decision Support) model]…Compiling the rationale statements in a document associated to the model would be a tremendous help to readers.”		version, and how the different pieces, such as ratings and rationale, are used in the model. Another main link from the home page of the website is the Rationale section, which includes the ratings of the alternatives for each subcriterion, based on the draft EIS, and an explanation of the Forest Service's rationale for those ratings.
14	Keith Reynolds, pp. II-17 to II-18: “…it would be of great value to future planning activities of the USDA Forest Service to carefully document the MCDS process…I think it is incumbent on the planning team to include an additional appendix to the DEIS that fully documents the MCDS process so that other administrative units of the agency may benefit from this experiment.”	Volume II—Appendix J, Multi-Criteria Decision Support	Appendix J, Multi-Criteria Decision Support, was added to the draft EIS.
15	Roberts & Wilson, p. II-20: “This section needs more uniformity (e.g., lacks structure), better connections needed between sub-sections, and there is a	Volume I—Chapter 4—Effects on Human Use, including Recreation, Scenery, and Socioeconomics	This section of the draft EIS has been reorganized and modified to respond to this general comment by providing better connections between the subsections, adding citations and making them more consistent, and focusing the discussions.

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	lack of consistency and in some cases-absence of any referenced citations within the text throughout this section (especially "recreation opportunities"). Broadly, the Human Use section is fragmented in its format and approach, rarely focused on management consequences and lacked convergence on the purpose of the report of the DEIS: To inform management in the decision-making process for the GSNM.”		
16	Roberts & Wilson, p. II-22: “The most relevant information was not always considered in the *Recreation Demand Analysis*. Our interpretation of this question hinges on the question of, ‘Considered for what?’ The answer to this implicit question was assumed to be, ‘considered for the purposes of the alternative plans’.”	Volume I—Chapter 4—Effects on Human Use, including Recreation, Scenery, and Socioeconomics—Effects on Recreation; Volume II—Appendix D, Recreation Demand Analysis	This assumption is incorrect. The recreation demand analysis is independent of the alternatives developed for the draft EIS; predicted recreation demand does not change by alternative. What does vary by alternative is how well the alternative responds to the predicted recreation demand. That variation is discussed in the Effects on Recreation section of Chapter 4, not in the recreation demand analysis. A paragraph explaining this was added to the beginning of Appendix D: A recreation demand analysis was prepared for the Monument for use in this planning process. This analysis is independent of the alternatives developed for the draft EIS; predicted recreation demand does not change by alternative. What does vary by alternative is how well the alternative responds to the predicted recreation demand. That variation is discussed in the effects on recreation section in Chapter 4, not in this appendix.

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17	Roberts & Wilson, pp. II-22 to II-23: "1. What are the different recreational and tourist activities currently occurring in the Monument and how is that changing over time? 2. Who is participating in these activities and how is that changing over time? 3. What structural variables facilitate or constrain participation across user groups and how is that changing over time? 4. Where are these activities currently occurring and how is that changing over time? 5. When do these activities occur? 6. Why do individuals engage in these activities? 7. How do motivations differ between user groups? 8. What is the potential and actual impact of different types of visitor activities on the objects of interest? 9. What aspects affect the	Volume II—Appendix D, Recreation Demand Analysis	This analysis did not attempt to answer these kinds of questions, as these are the types of questions that would typically be dealt with in a needs assessment that compares recreation demand with the existing supply, in order to determine needs. A paragraph was added to the beginning of Appendix D explaining that this is a demand analysis and not a needs assessment: This recreation demand analysis is not a needs assessment that compares recreation demand with the existing Monument supply of recreation opportunities and use patterns. A gap analysis (demand minus supply equals needs) was not performed, because such an analysis yields simplistic results that are not reflective of the complexities inherent in predicting human behavior or the uncertainties associated with predicting changing circumstances in the future. In addition, we do not have information specific to the Monument to be able to answer those questions with any degree of confidence.

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	impact of the recreational activities on the objects of interest (e.g., weather, concentration of users, facilities, etc.)? 10. What is the relationship between participation in these activities and conservation behaviors/attitudes? 11. Some sections (i.e., p. 257) start to highlight this issue, but a much more thorough analysis is essential. 12. What is the availability (location, economic cost, and access) of similar alternative activities (based on the variables of interest to participants) for current and future participants?		
18	Roberts & Wilson, p. II-23: "Another survey with applicable results would be the 1962 landmark ORRRC report (Outdoor Recreation Resources Review Commission)."		Although the ORRRC report contains much valuable information, it was not considered useful to include information from an almost 50-year-old report for predicting future recreation demand in the Monument.
19	Roberts & Wilson, p. II-23:	Volume I—Chapter	Citations were added in Chapters 3 and 4 and Appendix D.

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	"There is a near complete absence of in-text citations, footnotes, or endnotes."	3--Human Use, including Recreation, Scenery, and Socioeconomics—Recreation; Volume I—Chapter 4—Effects on Human Use, including Recreation, Scenery, and Socioeconomics—Effects on Recreation; Volume II—Appendix D, Recreation Demand Analysis	
20	Roberts & Wilson, p. II-23: "The use of unnecessary jargon (e.g., traditional users, forest zone of influence) makes it difficult for the average member of the public to interpret this information."	Volume I—Chapter 3--Human Use, including Recreation, Scenery, and Socioeconomics—Recreation; Volume I—Chapter 4—Effects on Human Use, including Recreation, Scenery, and Socioeconomics—Effects on Recreation	Terminology was changed or referred to a definition where one could be found.

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21	Roberts & Wilson, p. II-23: "Ambiguous statements, such as "various sources of information" limit the credibility of the author's statements."	Volume 1--Chapter 3--Human Use, including Recreation, Scenery, and Socioeconomics—Recreation; Volume I—Chapter 4—Effects on Human Use, including Recreation, Scenery, and Socioeconomics—Effects on Recreation	Links to references and citations were added.
22	Roberts & Wilson, p. II-23: "In our experience (review team) the Internet/computers is not a universal source of information among all ethnic groups. This conflict with previous research makes it essential for the authors to provide multiple sources to support this claim."	Volume II—Appendix D, Recreation Demand Analysis—Assessing Future Demand in the Monument	The L.A. phone survey (Crano et al. n.d.) found that family and friends and computers/the internet were most frequently reported as the most trusted information sources across all ethnic groups. Barriers to visitation were reported by ethnic group, with time constraints, lack of information, lack of interest, lack of transportation, health or physical limitations, no one to go with, distance, and lack of money frequently reported.
23	Roberts & Wilson, p. II-23: "Additional figures are needed to help explain the information:	Volume I—Chapter 4—Effects on Human Use, including	The Alternative C maps were only included because, in that alternative, development would be limited to those areas depicted on the maps. There are no such limitations in the other alternatives, or proposals for roads, tails, or signage, so that there is nothing meaningful to depict on additional maps.

<table>
<tr><th>#</th><th>SRP Comment</th><th>Location of Response in DEIS, Draft Plan, or Other Documents</th><th>FS Response</th></tr>
<tr><td></td><td>a) Map 22: “Recreation Opportunity Areas for Alternative C’ (p. 570) effectively presents geographic information for the reader. Similar maps for the following sections (i.e., roads, trails, signage) would be helpful for readers.”</td><td>Recreation, Scenery, and Socioeconomics—Effects on Recreation—Direct and Indirect Effects--Promotes Diversity of Uses</td><td></td></tr>
<tr><td>24</td><td>Roberts & Wilson, p. II-24: “Table 195: “Potential Improvement of Existing Scenic Integrity” (p. 586) is a wonderful matrix; however, it lacks information about how the Alternatives were classified as Low, Moderate, or High.</td><td>Volume I—Chapter 4-- Effects on Human Use, including Recreation, Scenery, and Socioeconomics—Effects on Scenery Resources—Cumulative Effects</td><td>Alternative F has the greatest potential to maintain and improve scenic integrity within the Monument followed by Alternatives B and E, which are followed by Alternatives A and C. Alternative D would be the least supportive of maintaining and improving scenic integrity because of the restrictions placed on vegetation treatments, the high risk of severe wildfire in areas valued for scenic beauty and the opportunities available to manage increases in visitation especially those associated with camping.
<table>
<caption>Potential Improvement of Existing Scenic Integrity</caption>
<tr><th></th><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th></tr>
<tr><th>Recreation</th><th>Moderate</th><th>Moderate</th><th>Highest</th><th>Lowest</th><th>Moderate</th><th>Moderate</th></tr>
<tr><td>Vegetation Management</td><td>Moderate</td><td>Moderate</td><td>Low</td><td>Low</td><td>High</td><td>Highest</td></tr>
<tr><td>Fuels Management</td><td>Moderate</td><td>Moderate</td><td>Low</td><td>Lowest</td><td>High</td><td>Highest</td></tr>
<tr><td>Roads</td><td>Low</td><td>Low</td><td>High</td><td>High</td><td>Low</td><td>Low</td></tr>
</table></td></tr>
<tr><td>25</td><td>Roberts & Wilson, p. II-24: “There is a lot of text and</td><td>Volume I—Chapter 4—Effects on</td><td>A table was added in Chapter 4. Depending on the comments received on the draft EIS, additional tables, graphs, or charts may be added for the final EIS.</td></tr>
</table>

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	few bullet points included. There are lengthy narratives discussing trends; yet without the use of graphs/charts providing a visual depiction of the data, makes it difficult to navigate the intent. Charts, tables, graphs, etc. would be helpful to explain all of the data."	Human Use, including Recreation, Scenery, and Socioeconomics—Effects on Recreation	
26	Roberts & Wilson, p. II-24: "With the exception of an explanation about the incommensurability of the survey data, there is no attempt to articulate what the uncertainties are with the literature and what the current limitations are in relation to that body of knowledge."	Volume I—Chapter 4—Effects on Human Use, including Recreation, Scenery, and Socioeconomics—Effects on Recreation—Analysis Assumptions and Methodology; Volume I—Chapter 4—Effects on Human Use, including Recreation, Scenery, and Socioeconomics—Effects on	The alternatives for managing recreation resources in the Monument are designed to follow the intent and spirit of the Clinton proclamation (2000). The text refers to recreation opportunities, which include facilities, programs, and the lands that provide the settings for recreation activities. Managers provide recreation opportunities, which allow visitors to have recreation experiences. Because recreation opportunities exist to serve people who have individual desires and needs, no one solution can adequately serve everyone; the "average" or "typical" recreationist does not exist (NARRP 2009), so that maintaining a spectrum of diverse recreation opportunities is important (Cordell 1999). Furthermore, people's recreation needs and desires change over time, in response to changing technology, changing societal lifestyles and demographic trends, and changing recreation activities (Cordell 1999, Sheffield 2005, USDA Forest Service 2006a). How those desires will change in the future is unknown at this time. Predicting the future is uncertain, because people are unpredictable; what is popular and in demand today may change several times through future years. Consequently, this plan strives to be flexible, in order to accommodate future recreation demand, while still protecting the objects of interest (sustainable recreation). A recreation demand analysis was prepared for the Monument for use in this planning process and is included as Appendix D; the surveys and references cited are noted in that appendix. Useful information includes lifestyle, demographic, and economic trends, all of

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		Recreation—Cumulative Effects—Population Growth/Societal Changes	which can affect how or if people recreate, as well as where and when (Cordell 1999, Sheffield 2005, USDA Forest Service 2006a); race, ethnicity, and gender also affect recreation participation (Cordell 1999). Recreation activity and participation trends were examined. Studies at various scales, covering the nation, California, or portions of the state, were reviewed for their applicability to the Monument. Some survey information is specific to the Sequoia National Forest, as a whole, and others provide insight to particular aspects of the Monument, such as visitor information. No one information source provides recreation participation information for the entire Monument. Consequently, information must be extrapolated from these other sources and applied to the Monument; the results are inherently uncertain. The various surveys cited provide a snapshot in time. The results are not directly comparable, because the surveys were conducted at different times, different sampling techniques were used, and different questions were asked. Yet, even though the surveys yield different results, they do provide insight to help determine future needs for recreation opportunities in the Monument. Despite what the science indicates, predicting the future is uncertain. The projected increase in population and societal changes would affect what recreation opportunities are provided (see the recreation demand analysis in Appendix D), including what kinds of development would occur and what activities would be allowed. Beyond the need for additional group opportunities, what new opportunities would be accommodated in the future is unknown at this time, due to the uncertainty inherent in predicting the future. Any proposals for new opportunities, including new development, changes to existing sites, and special uses, would undergo site-specific project analysis before they could occur.
27	Roberts & Wilson, p. II-24: "Relevant consequences are provided in several cases (e.g., promote diversity of users) yet in other sections (such as "promotes diversity of uses") the associated	Volume I—Chapter 4—Effects on Human Use, including Recreation, Scenery, and Socioeconomics—	The alternatives range in the diversity of recreation opportunities allowed. On one end of the scale (Alternatives B and F) would be a wide variety of uses to accommodate individuals' differing recreation preferences, with flexibility to respond to future recreation demand and new activities. On the other end of the scale (Alternatives C and D) would be a more limited choice of uses, with new development only allowed in certain areas or with limitations on the type of development, and the ability to respond to changing recreation demand and activities is more limited. Which recreation activities may occur in which

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	risks are not identified.”	Effects on Recreation—Direct and Indirect Effects--Promotes Diversity of Uses	locations are not specified for Alternatives B, C, D, and F in order to provide the greatest flexibility to accommodate new and changing activities as they emerge in the future. However, Alternatives C and D do have some limitations on the kinds of activities that may be allowed. Alternative C emphasizes developed recreation opportunities, but only in certain locations (recreation opportunity areas; see the following maps for their location). Alternative D would limit the development of new recreation facilities—no new roads would be allowed, so new picnic areas or campgrounds would be walk-in only. Which activities are emphasized in Alternatives A and E are listed in forest plan management emphasis area direction, which is somewhat more limited than what would be allowed in Alternatives B and F.
28	Roberts & Wilson, p. II-25: “Table 43 (p. 110): ‘Comparison of Alternatives by issues and their Unit of Measure’ is a good comparison of the Alternatives.”	Volume I—Chapter 4—Effects on Human Use, including Recreation, Scenery, and Socioeconomics—Effects on Recreation—Direct and Indirect Effects—Comparison of Alternatives	Another table with this information was added to the Effects on Recreation section of Chapter 4.
29	Roberts & Wilson, p. II-25: “These Alternatives impact different user groups inequitably. For example, Alternative D emphasizes primitive recreation which may support traditional users (middle class, able-bodied,	Volume I—Chapter 4—Effects on Human Use, including Recreation, Scenery, and Socioeconomics—Effects on Recreation—Direct	Multinational forest users have different expectations for their recreation experiences. For example, Hispanic recreation participation patterns are somewhat different from predominantly Anglo populations (California State Parks 1998, 2003, Sheffield 2005), such as in picnicking; Hispanics tend to participate with larger groups, arrive earlier in the day, and spend quite a bit of time in food preparation (Sheffield 2005). Many ethnically diverse groups show a preference for recreation at developed sites; the ability to accommodate this preference would be more limited in Alternative D than in any of the other alternatives, because Alternative D would allow the least amount of new development. With the emphasis on developed recreation sites in Alternative C, at first glance, this alternative

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	recreationists with primitive recreational skills), but would negatively impact disabled users or users that prefer to recreate in large groups (Hispanic/Latino users, larger families, etc.) that the Monument is attempting to attract. The problem is these disparate impacts are not clearly stated in the document."	and Indirect Effects--Promotes Diversity of Users	would seem to best accommodate the preference for recreation at developed sites. However, Alternatives B and F also have the potential for new development. Because of restrictions associated with development in some forest plan management emphasis areas, Alternatives A and E have slightly less potential than Alternatives B and F to accommodate the preference for recreation in developed sites.
30	Roberts & Wilson, p. II-26: "The most relevant recreation opportunities were not always considered, since this information does not specifically inform the potential impact of the alternative plans."	Volume I—Chapter 4—Effects on Human Use, including Recreation, Scenery, and Socioeconomics—Effects on Recreation—Analysis Assumptions and Methodology	What is included is a description of existing recreation opportunities in the Monument: The analysis of effects is based on how well the alternatives would meet future recreation demand and protect the objects of interest (qualitative unit of measure). Included within that analysis for each alternative is an assessment of the relative extent to which people could be accommodated at developed sites, the relative extent of dispersed recreation opportunities, and the relative extent of road and trail opportunities. Rather than identifying specific numbers of people at one time, site capacity, or road and trail mileages, this programmatic level analysis compares possible/probable/likely recreation opportunities allowed by each alternative, with specific numbers deferred to site-specific analysis when projects are proposed in the future. The alternatives for managing recreation resources in the Monument are designed to follow the intent and spirit of the Clinton proclamation (2000). The text refers to recreation opportunities, which include facilities, programs, and the lands that provide the settings for recreation activities. Managers provide recreation opportunities, which allow visitors to have recreation experiences. Because recreation opportunities exist to serve people who have individual desires and needs, no one solution can adequately serve everyone; the "average" or

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			"typical" recreationist does not exist (NARRP 2009), so that maintaining a spectrum of diverse recreation opportunities is important (Cordell 1999). Furthermore, people's recreation needs and desires change over time, in response to changing technology, changing societal lifestyles and demographic trends, and changing recreation activities (Cordell 1999, Sheffield 2005, USDA Forest Service 2006a). How those desires will change in the future is unknown at this time. Predicting the future is uncertain, because people are unpredictable; what is popular and in demand today may change several times through future years. Consequently, this plan strives to be flexible, in order to accommodate future recreation demand, while still protecting the objects of interest (sustainable recreation).
31	Roberts & Wilson, p. II-26: "There is a lack of in-text citations, footnotes, and/or endnotes. This makes it difficult to understand what parts of the report are based on existing research and what parts are the authors' opinions."	Volume 1--Chapter 3--Human Use, including Recreation, Scenery, and Socioeconomics—Recreation	Citations were added, but this is mostly a description of existing opportunities.
32	Roberts & Wilson, p. II-26: "**"Recreation Niche Settings"** - Table 103 (p. 264 and top p. 265): This information and detail is impressive. It corroborates other scientific literature on *niche conformance*. The author discusses the evaluation criteria in relation to what makes this forest a "special place".	Volume 1--Chapter 3--Human Use, including Recreation, Scenery, and Socioeconomics—Recreation—Recreation Niche	In developing the niche, each of the forest's 12 settings was evaluated by forest personnel against a combination of criteria, reflecting physical characteristics, visitor use, and market data (USDA FS 2006a). These criteria were viewed by forest personnel as the essence of what makes the Sequoia the special place that it is. Each setting was examined to see how well it met the following five criteria: • Whether or not giant sequoias exist; • Whether or not water exists (streams or lakes); • Whether or not the setting is popular or attractive for family use; • Whether or not the setting offers opportunities for overnight use; and

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	However, it is not clear who evaluated this or where the "criteria" came from."		• Whether or not viewing scenery is a reason people visit the setting.
33	Roberts & Wilson, p. II-26: "Sometimes it is difficult to understand the intention for why data is presented. For example, it is difficult to understand the relevance of the segment about land exchanges on p. 256 in relation to the topic of recreation."	Volume 1--Chapter 3--Human Use, including Recreation, Scenery, and Socioeconomics—Recreation	This information on land exchanges need to be captured someplace.
34	Roberts & Wilson, p. II-26: "All jargon and technical terms need to be defined when introduced in each chapter and need to be linked to definitions in the appendix (e.g., the term 'toys' on p. 265 should be replaced with the less value-laden term 'equipment')."	Volume 1--Chapter 3--Human Use, including Recreation, Scenery, and Socioeconomics—Recreation	This term is used in literature (such as Cordell 1999), but in this case was pulled from another document. The citation was added, and "equipment" put in parentheses: One way that visitors pick their destinations is according to the activities they prefer. The Sequoia National Forest's prevalent user groups could be classified according to the following descriptions (USDA Forest Service 2008a). **Water players:** This user group crosses a wide variety of ethnic, age, income groups, and skill levels, sharing their attraction to water. They are drawn to the "Rivers and Lakes" recreation niche setting. Their toys (equipment) or preferred activity dictate which water body they visit.
35	Roberts & Wilson, p. II-26: "This section did not present the theoretical context necessary to support the analyses."	Volume 1--Chapter 3--Human Use, including Recreation, Scenery, and Socioeconomics—Recreation	Chapter 3 is not analysis; it describes the existing situation.

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36	Roberts & Wilson, p. II-27: “All quantitative information requires tables and charts to help readers better understand the material. For example, the **User Groups** sub-section (p. 265) would be enhanced if a table was provided comparing the different demographic and participation information for the diverse user groups.”	Volume 1--Chapter 3--Human Use, including Recreation, Scenery, and Socioeconomics—Recreation—User Groups	This information is not available at this time.
37	Roberts & Wilson, p. II-27: “There was a tendency to find identical sections of text in multiple parts of the document.”	Volume 1--Chapter 3--Human Use, including Recreation, Scenery, and Socioeconomics—Recreation—Public Involvement; Volume 1—Chapter 4—Human Use, including Recreation, Scenery, and Socioeconomics—Effects on Recreation	Changes were made to the text so that the language is not identical.
38	Roberts & Wilson, p. II-28: “The uncertainties	Volume 1—Chapter 4—Human Use,	Predicting the future is uncertain, because people are unpredictable; what is popular and in demand today may change several times through future years. Consequently, this plan

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	associated with the information presented in relation to the recreation opportunities are not acknowledged and documented.”	including Recreation, Scenery, and Socioeconomics—Effects on Recreation—Analysis Assumptions and Methodology	strives to be flexible, in order to accommodate future recreation demand, while still protecting the objects of interest (sustainable recreation). No one information source provides recreation participation information for the entire Monument. Consequently, information must be extrapolated from these other sources and applied to the Monument; the results are inherently uncertain. The various surveys cited provide a snapshot in time. The results are not directly comparable, because the surveys were conducted at different times, different sampling techniques were used, and different questions were asked. Yet, even though the surveys yield different results, they do provide insight to help determine future needs for recreation opportunities in the Monument. Despite what the science indicates, predicting the future is uncertain.
39	Roberts & Wilson, p. II-28: “At times the language is ambiguous enough that it raises questions about the accuracy and certainty of the data (e.g., how much is a “small portion” p. 268 or what percentage is “A very large percentage of visitors to the Tule River are Hispanic and Southeast Asian”); however, the author does not specifically address this limitation.”	Volume 1--Chapter 3--Human Use, including Recreation, Scenery, and Socioeconomics—Recreation—Recreation Opportunities—Southern Portion	It would not have been meaningful to give an actual number; because work is ongoing, the information would have rapidly become outdated. An exact number is not available, so added language to note that this is based on visual observation: The river draws recreationists interested in many activities during the high use season and primarily sightseers, hikers, and anglers during the remainder of the year. Visual observation indicates that a very large percentage of visitors to the Tule River Canyon are Hispanic and Southeast Asian.
40	Roberts & Wilson, p. II-28: “There is a disconnect	Volume 1--Chapter 3--Human Use,	Management consequences are not relevant in Chapter 3; where the alternatives propose to address them, they are analyzed in Chapter 4. The draft EIS and management plan are

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	between the presentation of the Recreation Opportunity information and the management consequences.”	including Recreation, Scenery, and Socioeconomics—Recreation; Volume 1—Chapter 4—Human Use, including Recreation, Scenery, and Socioeconomics—Effects on Recreation	programmatic. No site-specific projects are proposed, so there are only indirect effects.
41	Roberts & Wilson, p. II-28: “Tule River (p. 286): This is the only sub-section in **Scenery Affected Resources** that directly mentions any controversy and management challenges for the forest (e.g., crowd / traffic control, Tribal relations, litter/graffiti, gang-related activity).”	Volume 1--Chapter 3--Human Use, including Recreation, Scenery, and Socioeconomics—Scenery Resources--Places	A paragraph describing the special management challenges was added to each of the Places listed in this section.
42	Roberts & Wilson, p. II-29: “The most relevant rural community economic and population trend information necessary for the management	Volume 1—Chapter 4—Human Use, including Recreation, Scenery, and Socioeconomics—	This section of Chapter 4 was reorganized around these questions. The last question will be addressed during site-specific project analysis.

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	Alternatives were mostly, but not always considered. 1. In order to definitively state "yes" to this criterion, this section would need to be explicitly organized based on the implicit questions of interest. These appear to be: a) What are the variables in the management Alternatives (e.g., recreation demand, timber production, etc.) that may have potential economic consequences? b) How are the estimated present values of economic benefit to different stakeholders (e.g., USFS, local businesses, local government, etc.) in the domains of interest (monument, local rural communities, and region) expected to change based on the different management Alternatives? c) How are the estimated present values of economic	Effects on Socioeconomics	

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	costs to different stakeholders in the domains of interest (monument, local rural communities, and region) expected to change based on the different management Alternatives? d) What is the cost and efficacy of methods to ameliorate the impact of different recreational and other human uses on the objects of interest?”		
43	Roberts & Wilson, p. II-29: “Some of the data in the **Travel & Tourism** section was obtained through single-sources. For example, the USFS contribution to the local economy (p. 319) could be potentially enhanced by including additional studies.”	Volume 1—Chapter 3-- Human Use, including Recreation, Scenery, and Socioeconomics—Socioeconomics--Major Natural Resource Economic Sectors—Travel and Tourism	Does this mean that we should conduct additional studies to improve our knowledge, or does this refer to existing studies? Need clarification on this point…referring to studies that exist to support conclusions (conversation 5/30/10). Expanded on sources in Chapter 3 footnote.
44	Roberts & Wilson, p. II-30: “There is a lack of clarity about how information from different parts of the **Human Use** section fit	Volume 1—Chapter 3-- Human Use, including Recreation, Scenery, and	Links between Recreation and Socioeconomics sections added in draft EIS. Additional links to the Effects on Recreation section of Chapter 4 were included to improve connectivity (5/25/10).

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	together. For example, there is a respectable level of socioeconomic information under the **Socioeconomic Affected Environment** in Ch. 3 that answers questions that readers may develop reading earlier sections."	Socioeconomics; Volume 1—Chapter 4-- Human Use, including Recreation, Scenery, and Socioeconomics	
45	Roberts & Wilson, p. II-30: "Additional linking in Ch. 3 Affected Environment between the **Recreation** and **Socioeconomics** sections would enable readers to understand how each section (e.g., **Recreation** and **Socioeconomics**) fit together."	Volume 1—Chapter 3-- Human Use, including Recreation, Scenery, and Socioeconomics; Volume 1—Chapter 4-- Human Use, including Recreation, Scenery, and Socioeconomics; Volume 2—Appendix D	Links added where appropriate in Chapters 3 and 4, and Appendix D.
46	Roberts & Wilson, p. II-30: "There needs to be a link between the notions of future changes in the state's population to how this may relate to the research questions being explored. To a policy-maker, it may	Volume 1—Chapter 4-- Human Use, including Recreation, Scenery, and Socioeconomics—Effects on Socioeconomics--	The population in the San Joaquin Valley alone is expected to grow by 60 percent between 2000 and 2020 (SJAPCD, 2009). Projections by the California Department of Finance show that by 2050 Kern and Fresno counties will be among the 10 most populous counties in California. The same report shows Kern and Tulare counties among the fastest growing counties in the same period. Hispanics are projected to be the majority in all three counties by 2050.[(1)] These county-wide trends are driven by rapid changes in the San Joaquin Valley. The gateway communities in the mountainous eastern parts of the counties have, in the past, had a different dynamic. If past trends continue, these gateway communities will

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	not be clear what the context is or should be (i.e., demographics trends are referenced but better connections need to be made to the purposes of the DEIS)."	Indirect Effects	continue to be slower growing, predominantly white and somewhat older than the rest of their respective counties.
47	Roberts & Wilson, p. II-30: "The legend for Tulare is inadvertently flipped, meaning it is listed in the wrong position (p. 314, Figure 22). That is, the top two graphs (Fresno & Kern) both note 'secondary' data as large/vast regarding secondary timber related employment. The written statement notes "largest number in all 3 counties is in secondary…" thereby indicating the reference to 'secondary' in the graph's legend as being in reverse order and therefore could potentially be deceiving regarding what the graph is trying to represent."	Volume 1—Chapter 3-- Human Use, including Recreation, Scenery, and Socioeconomics—Socioeconomics--Major Natural Resource Economic Sectors--Timber	These figures are from an outside source and cannot be changed at this time.
48	Roberts & Wilson, p. II-31: "*Method of Commute*	Volume 1—Chapter 3-- Human Use,	The attempt is to demonstrate a gateway community's capacity for developing its economic base (i.e., is it a bedroom community?). Method of commute does not assist in this, so these

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	charts: The reason these charts are included in this report is not clear. The purpose for why this detail is incorporated lacks support."	including Recreation, Scenery, and Socioeconomics—Socioeconomics—Gateway Communities	charts were deleted from Chapter 3. Whether residents work in a community and/or their commute time are better indicators of capacity.
49	Roberts & Wilson, p. II-31: "Given the recent high levels of unemployment in the nation and in California in particular, it would be prudent to update the unemployment data with more recent data (p. 306)."	Volume 1—Chapter 3-- Human Use, including Recreation, Scenery, and Socioeconomics—Socioeconomics—Fresno, Tulare, and Kern Counties Socioeconomic Profile--Unemployment	http://www.bls.gov/news.release/srgune.htm accessed on 5/19/10: In 2007, the unemployment rate was 8.6 percent in the three-county area, compared to 5.4 percent in the state and 4.6 percent in the nation. In 2009, the annual average unemployment rate rose in all states. The U.S. jobless rate rose 3.5 percentage points in 2009 from the prior year to 9.3 percent nation-wide.**(17)** In California, the average annual unemployment rate in 2009 rose 4.2 percentage points from the prior year to 11.4 percent. For the period February 2009 through March 2010 the unemployment rates were 15.7 percent in Fresno County; 14.3 percent in Kern County; and 16.1 percent in Tulare County. Since 1990, the unemployment rate in the three-county area varied from a low of 8.0 percent in 2006 to a high of 16.2 percent in 1993. Importantly, the unemployment rate throughout the San Joaquin Valley is consistently higher than the state or the nation as a result of the seasonality of the agricultural economic sector.
50	Roberts & Wilson, p. II-32: "This section fails to link the presented material with the management consequences of interest."	Volume 1—Chapter 4-- Human Use, including Recreation, Scenery, and Socioeconomics—Effects on Socioeconomics	The "Public Values, Beliefs and Attitudes" section of Chapter 3 discussed the importance of understanding public issues and developing goals, or criteria, for evaluating alternatives against them. One important goal identified by stakeholders was "fostering socioeconomics." Two key metrics associated with this goal include: supports gateway economic development and provides for diverse economic opportunities (other metrics for this goal can be found elsewhere in this chapter). Before assessing the alternatives against these metrics it is important to place them within the context of the existing condition as described in the socioeconomic section in Chapter 3. Chapter 3 highlighted key aspects of the three-county area including changing demographics in urban areas, increased population growth, double-digit unemployment rates associated with the latest economic downturn, and a growing emphasis on the health and social service economic sector. The

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			scale and scope of these changes simply overwhelm the current role of Forest Service-related contributions to the area's economy, which represents a mere 0.11 percent of the labor income across all economic sectors in the three-county area. It follows then; that regardless of the alternative selected, the economic impact to the area of influence has the potential to remain less than one percent. This does not mean potential differences amongst alternatives are unimportant, particularly to gateway communities, yet these economic and social realities form the backdrop for considering the scale and scope of potential changes resulting from the proposed actions on the Monument. In addition to the social and economic uncertainties facing the three-county area is the capacity for communities to respond to these changing conditions. This is particularly true for gateway communities within the area of influence. Monitoring changes in demographic patterns can assist both communities and the Monument in remaining responsive to changing societal needs over time. Monitoring gateway community capacity for economic development could include the indicators covered in Chapter 3: housing, employment by industry, the index of industrial specialization, place of work, and source of income. While not exhaustive, these indicators are readily available and will be updated in the 2010 U.S. Census, allowing for tracking changes over time.
51	Roberts & Wilson, p. II-32: "As detailed under Criterion 1, this section could do a much better job of explicitly structuring the text to address management questions and decisions needed. a) The detailed analysis provided in the **Secure Rural Schools and Community Self-Determination Act of 2000**	Volume 1—Chapter 4-- Human Use, including Recreation, Scenery, and Socioeconomics—Effects on Socioeconomics	Chapter 3 also highlighted the role of transfer payments to counties through the re-authorized Secure Rural Schools and Community Self-Determination Act (P.L. 110-343). While the alternative selected may influence the type of projects recommended by a Resource Advisory Committee (RAC), the individual projects are site-specific and beyond the scope of this document. The total available dollars authorized by the Act through Fiscal Year 2011 is unrelated to the Monument draft EIS and Plan and does not vary across alternatives. Key to this legislation is that through planning and implementing projects, cooperative relationships among people that use and care for Federal land and the agencies that manage Federal land will improve.

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	section of the report reviewed reflects the magnitude of management impacts of the GSNM in relation to this tri-county area of influence. b) The current ability and future potential of projects under Title II, for example, shows many realistic management actions that can occur over the next 3-5 years and beyond (p. 311). c) According to this section of the report, "all three counties have elected to use a Resource Advisory Committee (RAC) to recommend special projects on federal land" (p. 312). This offers a level of strength added to the scientific inquiry that has led to enactment of this Public Law (PL 106-393) to begin with providing essential support for the Forest Service with the potential for improving		

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	community relationships.”		
52	Roberts & Wilson, pp. II-34 to II-38: “RECOMMENDED REFERENCES FOR CONSIDERATION”		Some of these references have been reviewed and more of them will be reviewed between the draft EIS and the final EIS, to find additional information that would be useful in predicting recreation demand.
53	Scott Stephens, p. II-39: “Small groups of similarly sized/aged giant sequoia have been detected in the field but I have seen little evidence of ‘large even-aged cohorts’. Nate Stephenson’s work point to average group sizes well below an acre, with most groups much smaller than an acre.”	Volume I—Chapter 3—Vegetation, including Giant Sequoia Groves--Giant Sequoia Ecology Overview—Giant Sequoia Regeneration	Young sequoias must grow large enough to survive the effects of fires, especially when human-caused fires are more frequent than natural fires sparked by lightning. It is also likely that one or more decades are required between burning to enable a young sequoia to grow large enough to withstand the heat at the base of the stem. Sporadic regeneration of the species in clusters of a few trees or small even-aged patches up to an acre is more an ecological trait and an adaptation to periodic fires than an environmental concern. Even-aged cohorts greater than an acre are rare, but may be found as a result of past stand replacement events like a wildfire or mechanical harvest.
54	Scott Stephens, p. II-39: “I agree that you can kill small white fir and incense-cedar with prescribed fire. However the statement ‘Smaller white fir and incense-cedar tree up to 6 inches or more in diameter are easily killed in light to …’ The term 6 inches or more is problematic. How much larger? When white	Volume I—Chapter 3—Vegetation, including Giant Sequoia Groves--Giant Sequoia Ecology Overview—Stand Structure in Sequoia Groves	White fir and incense cedar do not require the early seral stages of seed dispersal, germination, and growth. They can regenerate under many diverse conditions of light, forest floor cover, and soil moisture found in groves. Smaller white fir and incense cedar trees up to 6 inches or more in diameter are easily killed in light to moderate intensity burns. The resistance of the tree in terms of physics and tree physiology depends on many factors such as species, bark thickness (insulation), intensity of heat at the base of the stem, and the duration of the heating event. Smaller trees generally have thinner bark, and trees that are less than 2 or 3 inches in diameter are seldom resistant to low to moderate severity burns. When mortality is due to crown scorching or burning, then the resistance of the tree will be based on protection of buds and meristems, distance from the heat, intensity, and duration. Prescribed fires of moderate or variable intensity often kill small trees that serve as ladder

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	fir gets even moderate diameters it can become resistant to mortality from prescribed fire. One paper that presents data on this is for the Sierra is Stephens, S.L., and M.A. Finney, 2002. Prescribed fire mortality of Sierra Nevada mixed conifer tree species: Effects of crown damage and forest floor combustion. Forest Ecology and Management 162: 261-271."		fuels either by stem or foliar damage. Trees of many sizes may have foliage close to the ground that could be ignited. Stephens and Finney (2002) observed that tree diameter was a significant parameter in all mortality models developed except for giant sequoia and sugar pine. The insignificant diameter factor in the giant sequoia model was presumed to be a result of giant sequoia's ability to resist high amounts of crown damage. Where crown damage was not a major factor, trees 10 inches and larger had a high probability of surviving prescribed fires.
55	Scott Stephens, pp. II-39 to II-40: "I have not seen information on return intervals of several hundred years in giant sequoia groves expect possibly the last 100 years before of fire exclusion."	Volume I—Chapter 3—Vegetation, including Giant Sequoia Groves--Giant Sequoia Ecology Overview—Stand Structure in Sequoia Groves	The presence of a wide range of sizes and ages of cedar and fir thus indicate that these shade tolerant species are a part of the natural giant sequoia ecosystems under a sporadic fire regime. Fire return intervals in giant sequoia ecosystems may have ranged from a few years to several hundred years depending on the location and size. Past human interventions preceding the more recent fire suppression likely resulted in unnaturally frequent burning cycles. Based on this, the recommended management entries, such as using mechanical or fire treatments for returning low to moderate intensity fire to national forest giant sequoia groves, should be in the range of 5 to 20 years (Piirto and Rogers 2002). Although fire may have occurred in most groves on a similarly frequent basis, it is likely that only portions of a grove burned. Sequoia ecosystems are highly variable in moisture and topography and have adapted to fire return intervals that are irregular in both location and length of time. Whitethorn (ceanothus), a species that germinates after heat exposure and is commonly associated with giant sequoia, is often missing in the understory. After moderate to intense fires, however, this species will often germinate and assume a position in the newly established early seral phase. It is not known for sure, but it appears this species has seed

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			that can lay dormant for more than 200 years, allowing it to assume a place in a giant sequoia ecosystem that has not burned for over a hundred years. Thus, it would be misleading to limit explanations of sequoia natural regeneration as dependent on the most frequent return intervals where the characteristic fires were likely relatively small, patchy, and low severity. The more productive areas of a grove are the areas with more moisture. The higher humidity and fuel moisture would result in a reduced burn frequency. This suggests it would be important to consider longer natural burning frequencies and larger disturbance events, especially where an investigation is designed to find more than just a few sequoia recruitments. Fire scar analyses that find more frequent burns may merely indicate the increased frequencies of past human-caused ignitions or the spread of fires from the adjacent drier forests within or outside a grove.
56	Scott Stephens, pp. II-40: "'Exposure to sunlight in extremely hot weather, where the canopy openings is greater than 70%, may reduce the growth and survival of first year giant sequoia seedlings (Hannt unpublished).' I cannot fully understand this sentence."	Volume I—Chapter 3—Vegetation, including Giant Sequoia Groves--Giant Sequoia Ecology Overview—Giant Sequoia Regeneration	Giant sequoia has been considered shade intolerant throughout the various stages of its life (Harvey et al. 1980). Young giant sequoia seedlings, however, can tolerate and may even need some shade until their root systems are established. Survival of sequoia seedlings in the first year appears to be very sensitive to the amount of direct sunlight reaching the seedling. This may also be related to the timing of growth of roots and amount of duration of heat during the growing season. While it is clear that established giant sequoia grows best in direct sunlight, first year seedlings may not. Exposure to sunlight in extremely hot weather where the canopy opening is greater than 70 percent may reduce the growth and survival of first year sequoia seedlings (Hanna unpublished). After the initial establishment, sequoia trees grow better in full sunlight. Under continued shade, they will grow slowly and can remain alive as a small tree (5 to 15 feet tall) for 30 to 100 years or more. As with many trees that show an intermediate tolerance to shade in the juvenile stages, giant sequoia will die after several years under a very dense canopy (Hanna unpublished). It will still require field testing to determine why survival of sequoia seedlings in the shade in the first year may be much better than survival in full sunlight. This may become more important to study if we continue to experience warmer, longer, and drier summers.
57	Scott Stephens, pp. II-40: "It is unclear what caused the growth release in old *S. giganteum* trees, although	Volume I--Chapter 4--Effects on Vegetation, Including Giant	The size of a tree is just one factor among many to consider. It is not a direct factor, but one that relates to more important factors such as access to water, nutrients, and sunlight. Discussions in the previous sections partially address this question.

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	liberation of belowground resources following removal of competing vegetation appears to be a significant contributor. Old trees of many species can respond to removal of competing vegetation. *S. giganteum*, the third-longest lived and the largest of all species, remains sensitive to local environmental changes even after emerging above the surrounding canopy. Management activities that reduce vegetation surrounding individual specimen old trees can be expected to result in increased vigor of even these very old and large trees."	Sequoia Groves--Indirect Effects—Effects of Alternatives and Climate on Forest Ecological Restoration and Resiliency—Forest Stand Structure, Individual Tree Vigor, Density, and Resilience	It is well-known to many silviculturists across the nation that given similar age, genetics, and environmental factors, larger trees generally respond better than smaller trees. This is true with both hardwoods and conifers. It is easily explained in principles of tree physiology and has been a fundamental principle behind intermediate and regeneration silvicultural techniques for decades. Much past removal of the largest and presumably the oldest trees in the Pacific Northwest was done under the general assumption that these trees had reached critical limits in age. Crowns of older giants were often declining. In trees with numerous internal vessel embolisms that reduced water uptake, whether in Douglas-fir in Oregon or red oaks in North Carolina, positive growth responses to weather extremes or disturbances were greatly reduced. On a large-scale program on the Umpqua National Forest in Oregon in the late 1970s, larger trees, regardless of physiological condition, were targeted for removal even though many may have lived hundreds of years longer. Providing favorable growth conditions for larger trees that are in good health will not only enhance their growth more than smaller trees, but may allow those larger trees to live longer. Increased vigor of larger, older trees as a response to thinning has been observed in Douglas-fir (Newton and Cole 1987) and ponderosa pine (McDowell et al. 2003). Numerous observations have found the large giant sequoia trees often respond to disturbances regardless of age. This is evident in tree ring analyses and has been demonstrated in field tests. York et al. (2010) observed that older sequoias and white fir displayed growth enhancements for 10 years after gap creation and removal of vegetative competition. They concluded that management activities which reduce adjacent vegetation can increase the vigor of very large and old giant sequoias (Roller 2004). One cannot assume that larger trees will respond the same as small trees. While each tree may be faced with increased stress due to higher heat and more competition for moisture and nutrients, a tree with a larger root system will have access to more volume to draw from. On the other hand, a tree with a smaller leaf area will have a reduced requirement for moisture and nutrients. In many cases a larger tree that has reached its peak height may have also reached its peak leaf area within a given stand structure and climate. A root system that has been balanced over the decades with the variable demands of leaf area and has access to deeper soil or lithic (rock-based) water may easily weather several years of

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			drought while smaller trees with roots in less deep soil may die within a few years during a normal drought. In an extended drought or a climate changing to warmer temperatures, snow depths are reduced or lost early and soil water is often not replenished. Deep, lithic water, which is dependent on water that infiltrates and percolates in a vertical plane or water that flows parallel to rock strata will also be reduced. It may take longer for deeper rooted trees to suffer from droughts. In the mixed conifer communities of the Monument, it is common to observe pines with roots that follow deeply into fractured granitic rock. Blue oaks can be found in the middle of dry meadows with a root system almost entirely within a few major cracks in bedrock. Valley oaks often have very long root systems in this oak zone that extend to subsurface water. These phreatophytic or deeply rooted plants can reach large diameters when all other trees are stunted by short growing seasons. In 2008, after several years of drought large, old valley oaks in the Monument could be found highly stressed or dead due to reduced groundwater flow from higher elevations. Without site-specific investigation and experienced observations, a field person would not know exactly how much or where this occurs. On a programmatic basis, the treatment responses of tree by size would be somewhat inconclusive. However, on a project level basis, there may often be enough evidence of moisture stress to prepare guidelines to select featured trees by phenotypic or visible features, such as crown dimensions, growth rate, canopy class, and other factors, to consider in promoting the best habitat for protecting remaining trees and for maintaining or promoting resiliency to withstand further drought, insects, and diseases. As a general statement, a larger tree that displays a sustained accumulation of stem growth over the decades would be favored for survival over a smaller tree of the same age. Smaller trees that are younger may currently be healthier, but may not necessarily be retained in a prescription designed to favor the longer-term maintenance or restoration of forests with larger trees. In many cases with bark beetles (*Dendroctanous spp*.), larger trees are the first victims in outbreaks. Larger trees that are growing vigorously, however, may survive several years of bark beetle attacks. It is evident in the field, that given two larger trees that

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			are the same size, the younger tree is often more resistant to bark beetle attacks. The major challenges faced in managing multiple species of trees on many different types of sites, along with the many biotic and abiotic factors that work in ways ranging from synergistic to antagonistic continue to make silviculture both a science and an art. It is a science that will continue to rely on local research and sound tested principles of plant and soil relationships. It is an art where experienced field silviculturists design a prescription that observes the past and present, yet predicts into the future while considering the type and severity of risks involved. When faced with a lack of quantitative research to indicate exactly how to treat a particular forest ecosystem, a silviculturist falls back on the basic scientific principles of providing growing space, structure, and species selection, in prescribing how to best protect a stand of trees. Special precaution should be taken when preparing program level standards, especially for highly complex and changing conditions related to managing forest ecosystems. There is a trend to prepare simplistic standards to cover all environmental concerns against taking an action. These standards are often unduly restrictive. A more general set of standards responding to issues such as climate change will focus on the need for flexibility and versatility in treatments. It is not known what intensity of treatments will be required. If they were known, it would be a stand-by-stand or ecosystem-by-ecosystem level analysis. These types of analyses, as stated above, will be addressed at the project level.
58	Scott Stephens, pp. II-41: "Burning with different prescriptions (firing patterns) will also create diversity in fire effects instead of only burning at different seasons."	Volume I—Chapter 3—Fire and Fuels—Characteristic Fire Regimes	Knapp et al. (2009) recommend that prescribed burning be conducted at various times of the year or with different prescriptions (firing patterns) to maximize diversity and to alleviate the potential for undesired changes that may come with repeated burning at a single time of the year.
59	Scott Stephens, pp. II-41: "Appendix referenced has no number."	Volume I—Chapter 3—Fire and Fuels—Characteristic Fire Regimes	For more information about fire regimes for the Monument, see Appendix H of this draft EIS.
60	Scott Stephens, pp. II-41:	Volume I—Chapter	Fire history on the Sequoia National Forest shows 60 percent of fires are attributed to

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	"Over what time period does your human and lightning ignitions data come from?"	3—Fire and Fuels—Fire History	lightning and 40 percent to human causes. Within the Monument, 50 percent of fires are lightning-caused and 50 percent human-caused. A total of 2,121 recorded fires occurred within the Monument between 1969 and 2008.
61	Scott Stephens, pp. II-41: "How much area has been burned with fire use? I know the Sequoia has been doing this for several years."	Volume I—Chapter 3—Fire and Fuels—Fire History	Data for managed wildfire added to the table following: Between 2003 and 2009, the Sequoia National Forest managed 28,697 acres of fires caused by lightning (managed wildfire). There have been no individual managed wildfires in the Monument greater than 10 acres.
62	Scott Stephens, pp. II-41: "Slope is another factor that influences fire behavior, it is not included here."	Volume I—Chapter 3—Fire and Fuels—Fuels Management	Fuel consists of a combination of living and dead vegetation. Fuel moisture content, size (surface area to volume), distribution and structural arrangement in the stand and on the landscape, quantity (loading), and chemical content interact with weather and slope to determine fire behavior. Changes to any of these variables can influence potential fire behavior and fire effects to meet the desired outcomes of a management activity.
63	Scott Stephens, pp. II-41: "How can weather during a prescribed fire be adjusted? Is the firing pattern adjusted? Or do you select a different weather window?"	Volume I—Chapter 3—Fire and Fuels—Fuels Management	Weather conditions (such as relative humidity, wind) during a fire also influence fire behavior and can be adjusted to accomplish specific desired effects if fires are prescribed to burn under a limited set of weather conditions, prescription parameters, and weather windows.
64	Scott Stephens, pp. II-41: "A range of fuel loads is reported here (26-103). What fuel components does this include? Only surface fuels? Duff?"	Volume I—Chapter 3—Fire and Fuels—Fuels Management	Fuel loading is a quantifiable measure of fuel in a given area, usually expressed in tons per acre by size class. Fuel load is a key characteristic to track, and the measurements are useful for identifying when current fuel conditions will support fire intensities and severities that exceed historic reference conditions. Fuel loadings are often assessed before treatment to determine how much to reduce the fuels. Sequoia groves in the Monument have been inventoried and assessed for average fuel loading. These inventories represent the range of conditions in the groves and include surface fuel and duff loadings. The giant sequoia grove averages (for 16 giant sequoia groves), including duff, are up to approximately 60 tons per acre (for more detailed data see the silviculture report).
65	Scott Stephens, pp. II-41:	Volume I—Chapter	Fuels management can be viewed as managing potential fire intensity. Fire intensity refers

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	"Fireline intensity is the product of biomass consumption, rate of spread, and heat content of the fuel. The latter term is not included here."	3—Fire and Fuels—Fuels Management	to the amount of energy released by the fire (USDA Forest Service 2001d, p. 242) and is a physical parameter that can be related to flame length. Fire intensity can be determined from the product of biomass consumption (energy), rate of spread of the fire, and heat content of the fuel (Agee 1996).
66	Scott Stephens, pp. II-41: "How does the management for the historic fire regime relate to an era of changing climates? One paper that discusses this issue is Millar, C.I., N.L. Stephenson, and S.L. Stephens. 2007. Climate change and forests of the future: managing in the face of uncertainty. Ecological Applications 17(8): 2145-2151."	Volume I—Chapter 3—Fire and Fuels—Fuels Management	While there are many important lessons to learn from the past, we believe we cannot rely on past forest conditions to provide us with blueprints for current and future management (Stephens et al. 2010). In particular, the nature and scale of past variability in climate and forest conditions, coupled with our imprecise ability to fully reconstruct those conditions, introduce a number of conceptual and practical problems (Millar and Woolfenden 1999a). Detailed reconstructions of historical forest conditions, often dendro-ecologically based, are very useful, but represent a relatively narrow window of time and tend to coincide with tree recruitment in the generally cooler period referred to as the little ice age. As such, manipulation of current forests to resemble past conditions may not produce the desired result when considering future climates (Stephens et al. 2010).
67	Scott Stephens, pp. II-41: "What is the 'fire susceptibility rating'? Need to define this."	Volume I—Chapter 3—Fire and Fuels—Landscape Conditions—Fire Susceptibility	To quantify the shift of vegetation from a resilient fire-dependent ecosystem to an ecosystem that is susceptible to uncharacteristic damage from wildfire, a fire susceptibility rating was developed for the Sequoia National Forest. Fire susceptibility is an indicator of the possibility of large severe fires. There is higher potential for large severe fires in areas of high and moderate fire susceptibility under high fire danger weather conditions than in areas of low susceptibility. The rating uses severity, hazard, and risk to identify areas on the forest that have high, moderate, or low susceptibility to wildfire (shown in the table below). This index is used as a tool for prioritizing areas that need treatment, particularly around communities within high fire susceptibility areas.
68	Scott Stephens, pp. II-41:	Volume I—Chapter 3—Fire and Fuels—	Paragraph was deleted.

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	"'One of the contributors to intense fire behavior and fuel availability is the shift from the open, fire resistant crown structures and surface fuels that support frequent fire, toward open tree canopy structures favored by fire-resistant species that are naturally found in the Monument (giant sequoia, ponderosa pine, sugar pine) to more susceptible ones. The third factor, risk, is a measure of the likelihood that an ignition will occur based on historical fire occurrence.' I cannot fully understand the first sentence above. Regarding the 2nd sentence, I would add that we are not only interested in historic fire occurrences but also how this will change in an era of changing climates."	Landscape Conditions—Fire Susceptibility	
69	Scott Stephens, pp. II-41: "A good set of information for the southern Sierra Nevada comes from	Volume I—Chapter 3—Fire and Fuels—Landscape Conditions—Fire	Many studies have documented the importance of large trees in forests for many ecological processes and their value for wildlife habitat (North et al. 2009). Some research suggests that, for managing fuels, most of the reduction in fire severity is achieved by reducing surface fuels and thinning smaller ladder-fuel trees. What is considered a ladder fuel differs

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	Malcolm North's work at the Teakettle Experimental Forest. I don't see any of Malcolm's references here, I think they would be applicable. One good place to see many of his papers is in the literature cited section of North, M. P. Stine, K. O'Hara, W. Zielinski, and S. Stephens. 2009. An Ecosystems Management Strategy for Sierra Mixed-Conifer Forests. US Dept. Agriculture Forest Service Pacific Southwest Research Station. General Technical Report PSW-GTR-220 w/ addendum. 52 pages."	Return Interval	from stand to stand, but typically these are trees from 10 to 16 inches in diameter. If trees larger than this are thinned, it is important to provide reasons other than for ladder-fuel treatment (North et al. 2009).
70	Scott Stephens, pp. II-42: "Fire is in nearly all Monument ecosystems versus all ecosystems?"	Volume I—Chapter 3—Fire and Fuels—Restoration and Maintenance—Restoration of Fire as an Ecological Process	Fire is such a pervasive disturbance in nearly all Monument ecosystems that failure to include it as part of managing large landscapes will inevitably lead to unintended outcomes (Keeley et al. 2009). The restoration and long-term maintenance of Monument ecosystems will require the restoration of fire as an ecological process. Restoring the natural role of fire in many parts of the Monument will require a focused restoration of the fuel conditions that support fire. However, mechanical treatments, biomass removal, and even fire treatments that are specifically applied to reduce fuel loads or manipulate potential fire behavior are temporary in nature.
71	Scott Stephens, pp. II-42: "I believe that during the	Volume I—Chapter 3—Fire and Fuels—	Historic fires were a combination of Native American-ignited and lightning fires. While many of the fires were ignited locally, others would have burned into the Monument from

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	active fire regime that litter fuels would not be continuous, there would be discontinuities that would inhibit fire spread. 'Lightning ignited fires alone are unlikely to provide sufficient ignitions to restore fire to the Monument.' This is an interesting statement but is there some analysis to support this? Jan van Wagtendonk in Yosemite has published a paper saying that lightning ignitions might be adequate when looking at the pre historical fire regimes."	Restoration and Maintenance—Maintaining Fire as an Ecological Process	adjacent areas. There are some noted examples where the use of fire alone appears to have successfully promoted spatial heterogeneity and ultimately resilient forests (Stephens et al. 2010). In two different upper elevation Sierra Nevada mixed conifer forests that have experienced about 30 years of managed wildfires, the amount of stand-replacing fire in recent large fires was very low (3-12 percent) (Collins et al. 2007). Based on field data (Collins 2004) and satellite-derived images of fire severity (Collins et al. 2009, 2010), these large fires created a large degree of spatial heterogeneity both within individual forest stands and across the landscape (Stephens et al. 2010).
72	Scott Stephens, pp. II-42: "Miller et al. (2009) does show increased mean and maximum fire size and total burned area in the Sierra Nevada but not all forest types area similar. Mixed conifer is one that has seen some of the largest change but ponderosa pine much less. It might be a good idea	Volume I—Chapter 3—Fire and Fuels—Fuels Management	The discussion of climate change referenced is in the Assumptions and Methodology section of Chapter 4 and is a very general discussion. Additional discussions of climate change are in the Effects on Air Resources section of Chapter 4 and Appendix C. A paragraph discussing the relationship between fire severity and vegetation or forest type was added to the Chapter 3 Fire and Fuels section on Fuels Management: A natural baseline comparison of what fuel conditions should be is the historic fire regime. Each fire regime has a characteristic range of frequency and severity which influences and is influenced by the vegetation within it. Fire severity is a description of fire effects on the biological and physical

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	to add some more text here to clarify this."		components of the ecosystem (see Appendix H in the draft EIS). The characteristics of the fire regime help define the mosaic of vegetation types, age classes, and succession stages on the landscape (Turner et al. 1993). Fuels managers often measure the spatial distribution of fuels in the current fire regime and relate it to the historic fire regime to determine the appropriate direction of fuels management (Sando 1978). The characteristics of the historic fire regime are often supported by a fuel loading and structure that existed before European settlement.
73	Scott Stephens, pp. II-42: "I want to add that there is a set of papers from the central and southern Sierra Nevada that have shown that in an area of upper elevation mixed conifer forest subjected to lightning ignited fires for the last 35 years that there is no evidence of increase fire severity. I think these papers present information on what managed wildfire can do in remote areas."	Volume I—Chapter 4—Effects on Fire and Fuels—Indirect Effects—Alternative D	Where and when managed wildfire would be used is discussed by alternative in the Chapter 4 Effects on Fire and Fuels section: Generally, managed wildfire in Alternative D would be suppressed only under circumstances where smoke management requirements cannot be met or fire intensity reduces the probability of feasible protection for adjacent land, infrastructure, at risk objects and critical natural resources, or personnel and resources to manage the fire are unavailable. Fires would be allowed to burn hot enough to create openings and tolerate high mortality in fairly extensive areas of the Monument outside of the WUI. Giant sequoia groves in Alternative D would be managed using managed wildfire and prescribed fire. In general, fires would not be suppressed unless they occur in the WUI, threaten human safety, or have the potential to kill mature sequoias.
74	Scott Stephens, pp. II-43: "As fire becomes more active in future climates one of the mitigating factors to reduce undesirable effects is getting more fire on the ground and these papers	See #72 and #73 above.	See #72 and #73 above.

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	report on such a place in the central and southern Sierra. I think this perspective would add to this EIS."		
75			
76	William Zielinski, p. II-45: "Conspicuously absent, or at least not emphasized, is reference to a list of new scientific needs, so that we can continue to learn from the management of the monument. There must be general areas of uncertainty that new science can help resolve. Given the emphasis in the Management Plan—Part 3—Monitoring and Evaluation proclamation on "Scientific Study and Adaptive Management" (pg. 3, Vol. 2), I would expect the specialists to have included a list of potential research needs."	Volume I—Chapter 2—Alternatives Considered in Detail—Desired Conditions, Strategies, and Objectives	Desired conditions, strategies, and objectives for Scientific Study and Adaptive Management are described in Chapter 2, with the following objectives with specific needs: 1. Within 5 years, develop at least two scientific studies in the giant sequoia groves to research resilience to agents of change such as fire, drought, insects, disease, and climate change. Design experiments to investigate the responses, including regeneration, of giant sequoias to changes in temperature and moisture, and the complex interactions of these two factors. Publish results within 10 years of study initiation. 2. Continue and expand research on the effects of management activities on Pacific fisher and its habitat to better understand how these activities influence individuals, important habitat components, prey resources, and competition with other predators. After 5 years, evaluate the research findings and refine management direction. 3. Within 5 years, analyze all the landscapes (6th-field watershed scale) within the Monument to identify opportunities for site-specific projects.
77	William Zielinski, pp. II-45 to 46: "Also absent is reference to the development of a rigorous and science-based	Management Plan—Part 3—Monitoring and Evaluation	The draft Monument Management Plan contains a monument-specific monitoring plan that explains: The Monument Plan is an integral part of the adaptive management cycle that will provide a framework to guide future management decisions and

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	monitoring program that will track the status and trends in objects of interest. Monitoring is a key component of adaptive management and, in fact, adaptive management cannot be practiced without monitoring. I see very little reference to the quantitative means by which the objects of interest will be monitored. The Draft Management Plan has a few sentences about wildlife, and fisher, monitoring but I'm concerned that so little attention is dedicated to the scientific aspects of developing a monument-specific monitoring plan. There should be discussions about thresholds that will trigger changes, consideration of how monitoring data will feedback into decision making, and what statistical designs will be used. I'm surprised that monitoring		actions. Monitoring and evaluation activities in the Monument are closely linked to the adaptive management strategy in the 2001 SNFPA… Forest plan monitoring and evaluation is conducted to determine how well the management strategy for the Monument (strategies, objectives, and standards and guidelines) has been met, and how closely standards and guidelines have been applied…Most importantly, the monitoring plan includes elements for protecting the objects of interest identified in the Proclamation… A section called "Standards and Guidelines and Monitoring" was added at the end of the effects analysis for resource areas where appropriate, that explains how the standards and guidelines and monitoring for that resource area are designed to protect and care for the objects of interest. Additional monitoring specifically tied to the objects of interest was developed for the plan, and performance measures were identified, as appropriate for this programmatic level forest plan amendment. A description of wildlife monitoring, including the Pacific fisher, is included in the monitoring plan. The Lake Tahoe Basin Management Unit example was used as a template for the entire monitoring plan.

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	programs that currently apply to the monument, such as the Southern Sierra Fisher Population Monitoring program, are not referred to and discussed as to whether they will be used, or modified, to address future fisher and/or marten monitoring on the Monument. In my experience, the best forest-specific wildlife monitoring plans in California have been developed for the Lake Tahoe Basin Mgmt Unit – they should be reviewed as examples."		
78	William Zielinski, p. II-46: "It is important to understand that the CBI model was designed to evaluate general broad questions about the value of fuels treatments, and their locations, relative to their direct and indirect effects on fisher habitat and fisher populations at very large spatial scales. The CBI		References to the Conservation Biology Institute (CBI) model and site-specific project analyses have been deleted from the Biological Evaluation and the draft EIS.

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	model is *not* designed to evaluate the effects of individual projects (W. Spencer, pers. comm.).”		
79	William Zielinski, p. II-46: “…models published that can be used to evaluate the effects of projects on fisher resting habitat. This includes models developed from data within the monument specifically for the purpose of predicting resting habitat value from plot data (Zielinski et al. 2004a, Zielinski et al. 2006). One such model developed using data from the monument (Zielinski et al. 2006) is directly linked to FIA plot data, making it very easy to estimate future resting habitat value at FIA plots and any other plot where the variables in this model can be estimated using the Forest Vegetation Simulator (FVS) (Dixon 2002).”		We are aware of the models available for project-level analysis, but they are not appropriate for use in the programmatic level analysis. The models require site specificity and will be implemented when a site-specific project is proposed in the Monument. The Forest Inventory Analysis (FIA) program plots are not intended or designed to estimate local wildlife habitat. They are widely spaced plots intended and designed to provide landscape information. While they may serve to help on a programmatic level, the research station FIA (silvicultural exams) provide no statistical reliability for most project-level purposes.
80	William Zielinski, p. II-47:	Draft Wildlife	A reference to the FAST was added to the Biological Evaluation. Again, this is a project-

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	"Diane Macfarlane, from the Regional Office, has developed a tool for evaluating the effects of projects on fisher habitat, referred to as Fisher Analysis and Assessment Tool (FAST). I was surprised to see no reference to this important new tool in either the Specialist Report or either volume of the DEIS. Even if it is not relevant to programmatic documents such as the DEIS, it should be referenced in respect to future standards and guidelines for projects that will be proposed to implement the plan."	Biological Assessment	level tool available for analysis of effects on fisher habitat from project activities. This specific tool is not included in the standards and guidelines for wildlife because it may not be the most appropriate tool for all site-specific projects proposed during the 10 or more years this management plan is in effect.
81	William Zielinski, p. II-47: "North et al. (2009) finds little support in the scientific literature for removing conifers greater than 20-inch dbh if the goal is to reduce fire spread rate or severity…it is difficult to understand the need for so		We do not claim to have many quantitative details on the effects of removing trees larger than 20 inches. See responses to Comments #1 and #2 above. More local studies would be desirable. Mountain Home has good studies on thinning that can be continued or complemented (Roller 2004). While studies that specifically test the responses of removing trees greater than 20 inches do not pervade the libraries, the forest ecosystem/silvicultural sciences behind vegetation and tree stocking control are the most abundant and well-researched in natural resource management. The ability to interpret and properly extrapolate this data requires professional silvicultural training and experience. Alternatively, while we have substantial

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	much flexibility when a maximum of 4% of the monument per decade is predicted to be affected by wildfire…”		quantitative data on the adverse impacts to fisher from collar monitoring, road facilities, and wells, we have no substantial data on the adverse effects to fisher from thinning. The risk we assume to fisher in providing long-term protection to habitat would seem quite small compared to the potential risk of that habitat burning up. The need for flexibility can be a matter of perspective. The question that follows this concern could be, “if doing so little, why would we bother to treat any stands at all?” or, “if treating so little, why would removing a few trees over 20 inches be a concern?” Given so little acreage expected, a managing agency would want more flexibility. Given so few acres impacted, the programmatic and project level concerns for removing trees should be less. The need for flexibility in treating forest stands must not be based on the quantity proposed to treat, but on the plan purpose and desired conditions in the monument. Restrictions on treatment reduce the quantity and the ability of the managing agency to meet this purpose.
82	William Zielinski, p. II-47: “…there appears to be little scientific support for removing these trees in the interest of restoration or maintaining resiliency.”		See the responses to Comments #1, #2, and #81 above. The Proclamation statements that forested stands are more dense and that there is a need to restore ecosystems are based on scientific observations, including measurements taken in the Monument. Supporting citations would be helpful, but research from other locations is not meant to replace on-site field observations.
83	William Zielinski, p. II-48: “…it is not clear why the authors risk selecting an alternative where the risks to wildlife habitat are the “largest” and “high” (pg.116). Is this because the risks to loss of habitat from		Selection of an alternative by the deciding official must consider resource trade-offs or unclear risk. This is inherent in managing our national forests. Alternative F treats stands for resiliency and protection from drought, insects, disease, and fire more than any other alternative. While it will have the most favorable impact in the long run, it may have some immediate, short term impacts on certain species that require dense canopy. The initial effects of treatments that reduce tree densities may vary from one to 20 years depending on location in canopy and the plant species involved. The increase in resiliency from these restoration treatments will be

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	severe fire are greater? If so, this needs to be outlined in more detail…”		accompanied by increases in tree diameters in the remaining trees. See responses to Comments #1 and #2 above for more discussion on selection of tree size and responses to treatment. Monitoring in the 10th or 20th year will determine whether additional trees need to be removed from the main canopy or whether treatments, if any, should be limited to ladder and surface fuels. In most cases, the initial treatments will be designed to promote the use of the most effective silvicultural tools, such as fire or a combination of fire and mechanical. Monitoring conditions on the ground, especially in sequoia groves and special old growth habitat at five year intervals, will help ensure that ladder and surface fuels do not accumulate at levels so high that mechanical work is necessary before burning.
84	William Zielinski, pp. II-48 to II-49: “The document retains the legacy of direction from the Sierra Framework for limited operating periods and limited vegetation treatments in buffers around known fisher and marten reproductive dens. The logic of this action is indisputable in that reproduction is an important event and animals are presumed to be most sensitive to disturbance when their offspring may be at risk. However, this strategy only	Draft Biological Evaluation for R5 Sensitive Animals—Environmental Effects—American Marten Effects—Management Status; Draft Biological Evaluation for R5 Sensitive Animals—Environmental Effects—Pacific Fisher Effects—Management Status	We agree that, in order to make the den buffer conservation strategy more effective, further fieldwork will be required to identify these important areas. This issue is addressed in the Biological Evaluation, as follows: In the future, as research continues, more den site buffers may be established in other areas of the Monument.

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	can be effective if there is a companion program, each spring, of fieldwork to locate new dens. Illustrative of the failure of this approach, is the fact that there is only 1 protected marten den tree on the entire monument (pg. 72, Specialist Report) despite that buffers have been employed as a conservation practice for almost 10 years. This is because there has been no direction to fund the fieldwork necessary to find new dens, and no incidental marten studies that would produce this collateral information. A 'den buffer' conservation strategy will not succeed – and worse yet will provide the concerned public false assurances – if a program of fieldwork necessary to find new dens isn't advocated by line officers and adequately funded. Finding new dens, for		

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	fishers and martens, and determining how often they are reused (a measure of their relative importance) would be a good candidate for a new scientific study on the monument."		
85	William Zielinski, p. II-49: "Also, regarding den sites, it is not clear to me what takes priority if a fisher or marten den is within a WUI; which will have precedence? We don't know how fishers or martens will respond to structural changes to the vegetation in immediate vicinity of a den, but if treatment in WUIs trumps fisher or marten den protection, then it will be important to fund new science to evaluate the effects of this treatment."	Volume I—Chapter 2—Alternatives Considered in Detail—Reader's Guide to Alternative Descriptions—Land Allocations and Management Areas; Management Plan—Part 2—Land Allocations—Land Allocations and Management Areas;	This information is given in the table "Dominant Management Direction When Land Allocations Overlap."
86	William Zielinski, p. II-49: "Much is known about the sensitivity of martens, in particular, to forest fragmentation and the	Draft Biological Evaluation for R5 Sensitive Animals—Appendix A	The recommended references were added to the Biological Evaluation.

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	thresholds when this occurs yet none of this important literature (Bissonnette et al. 1997, Bissonnette and Broekhuizen 1995, Chapin et al. 1998, Hargis et al. 1999, Potvin et al. 2000) is referenced in either the DEIS or the Specialist Report (see pg. 69 – 71). This is an omission but, more importantly, reflects on the general lack of understanding of just how sensitive martens, and most likely fishers also, are to loss of dense forest cover. Moreover, the seminal reference on the status of martens, fishers and other carnivores in the Sierra Nevada is a paper we published in the Journal of Biogeography (Zielinski et al. 2005). This updates information in previous, earlier papers, and is conspicuous by its absence in this section.		

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	Also, an important new paper has been published in a preeminent ecological journal which summarizes the mechanisms that link martens to complex structural habitat, via their prey (Andruskiew et al. 2008). This should be read and considered. Finally, the Sequoia NF and Region 5 sponsored a key study in the 1990s on fishers and martens in the area now included in the monument. Much of the fisher-related science that came from this work has been published (Zielinski et al. 2004a, 2004b, Zielinski et al. 1999, Wisely et al. 2004, Drew et al. 2003), but not all of it appears to have been referenced, or used to influence, the fisher section of this document. For example, our paper on resting site selection by fishers (Zielinski et al.		

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	2006) includes in the predictive model the variable "basal area of small (5 < x < 51 cm dbh) trees" which indicates just how important dense small-diameter trees are to the selection of resting sites by fishers. This is a critical piece of information that should be addressed and discussed in terms of reconciling fisher habitat protection with the goal of reducing severe fire. Reference to the conclusions of the CBI report (Spencer et al. 2008) would help in this respect."		
87	William Zielinski, pp. II-49 to II-50: "Although the *marten* data from our Sequoia NF study has unfortunately not been published, it is available in a set of progress reports that were sent to biologists on the Sequoia NF (e.g, Zielinski et al. 1997). Reference to	Draft Biological Evaluation for R5 Sensitive Animals—Environmental Effects—American Marten Effects—Management Status	The American marten section of the Biological Evaluation was edited to include the Sequoia-specific studies and reduce discussion of the Humboldt marten.

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	this local information on marten habitat and marten population characteristics appears nowhere in the DEIS or the specialist report. This is unfortunate since the data were collected within the administrative boundaries of the monument. Instead, too much reference is made (pg. 71) to the Humboldt marten, which doesn't occur anywhere near the monument. I suggest deleting reference to the Humboldt marten entirely and emphasize the relevant inferences from the work on martens conducted within the monument. We trapped and studied martens on the Sequoia that occurred in lower-than-expected elevations, which may have implications for the calculated effects of WUIs on marten habitat (percents estimated on pg. 481, Vol. 1). Depending on how		

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	marten habitat is considered, this information may mean that WUIs may have greater effects on marten habitat that the current calculations indicate."		
88	William Zielinski, p. II-50: "Finally, there is no reference in the Specialist Report or the DEIS to the Joint Fire Science-sponsored work that examined the effects of various fuels treatments on predicted fisher resting habitat (Truex and Zielinski 2005). This work occurred on the Blodgett Research Forest (Eldorado NF) and the Sequoia Kings National Park, but is relevant throughout the central and southern Sierra. It demonstrates how mechanical thinning vs. spring or fall prescribed fire affects fisher resting habitat. Inferences from this work	Draft Biological Evaluation for R5 Sensitive Animals—Appendix A	The recommended reference was added to the Biological Evaluation.

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	apply to the conflicts that arise on the monument when reconciling the need for fuels treatments with the need to protect fisher habitat."		
89	William Zielinski, p. II-50: "Alt. C appears meant to represent a set of actions that will simulate the management actions used to maintain ecological resiliency at the nearby Sequoia-Kings Canyon NF (SEKI). If that is the case, where is the science that describes the status and quality of the monument's 'objects of interest' that also occur – or are similarly valued – in SEKI? Shouldn't there be a scientific examination of the current status of the park, in terms of ecological resiliency, application of fire, protection of species at risk, and other future desired conditions that provide similar vision for		Alternative C was given the same consideration as the other alternatives considered in detail in the draft EIS. Although we appreciate the opinion of the reviewer of the Alternative C, the Regional Forester has selected Alternative B as the preferred alternative.

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	the monument? …A more serious consideration of Alt. C would evaluate the body of ecological work that has come out of SEKI (and Yosemite)."		
90	William Zielinski, pp. II-50 to II-51: "References to the published literature are used inconsistently. In particular I draw attention to an entire section on indirect effects (pages 395-411, Vol. 1) which is dominated by unsubstantiated comments or 'pers. obs.' (which should at least be attributed to a person by name). This is unscientific and reads like a long collection of personal opinion garnered over a lifetime of experience. This material can have its place in management, but it detracts from the credibility of a document that is supposed to be based on the best available science. For example:		Citations have been added, and the personal observation citations now identify the source. 2nd bullet: See response to Comment #2 about the need to consider climate warming and drought. The concepts are not inconsistent with the North et al. (2009) report. The report, however, does not discuss in detail the potential need or degree of need to protect the more moist or productive sites in the monument. The report does not go into detail or make predictions concerning climate change, resilience, or insect and disease. The recent appendix acknowledges this more. Researchers in the Pacific Northwest are currently working on a peer-reviewed, but similar, approach at this time that discusses a reduced need for treatment on moist sites. This too will need to incorporate the potential effects of climate warming on sites previously thought to be naturally resilient and highly resistant to catastrophic fire. 4th bullet: The evidence of decline in larger black oaks in mixed conifer types is present in the field. The images are from an actual project designed to maintain or enhance fisher habitat and protect oaks, just as a citation may be from a certain research project. They effectively illustrate how conifers can and do overtop oaks and cause mortality from shading. The discussion and images are important in demonstrating the progression of forests from shorter, shade-intolerant species like oak to taller or more shade-tolerant conifer species. The Spectrum model run (habitat) supports the prediction that oaks will die from both fire and suppression in overly crowded stands.

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	• pg. 395: No reference for the assumption that fires would be "*larger and more severe*" (even though in the Specialist Report (pg. 22) the author(s) state that "only 4% of the Monument per decade will be affected by fire". • pg. 396: No reference to support treatment on "*more productive sites….north facing and riparian...*" In fact, this is contrary to the body of literature summarized in North et al. (2009). •pg. 396: No reference to literature, or analyses, to support the conclusion that "*Alternative F will accomplish most protection of forests from drought, insects, disease and unwanted fire*". •pg. 398: No ref to literature, or analyses, to support the statement: "*Larger black oaks in mixed stands will decline…. not*		

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	provided by mechanical methods". The entire section from 396-411 would benefit from fewer photographs and more figures and tables of the results of analyses. The authors appear to be attempting to make an argument using selected images of conditions or outcomes of management, rather than with more robust summaries of analyses in tables and figures. This section of text is unique, within Volume 1, in this respect."		
91	William Zielinski, pp. II-51 to II-52: "It appears that every assessment of the amount of affected habitat for martens and fishers is based on the absolute amount of habitat affected (e.g., pg 381, Vol. 1); there is no recognition that management can also affect the configuration and connectivity of habitat. It is		We are aware of the models available for project-level analysis, but they are not appropriate for use in the programmatic level analysis. The models require site specificity and will be implemented when a site-specific project is proposed in the Monument.

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	has long been recognized that many species are affected as much by landscape *habitat configuration* as by *absolute amount* of habitat (Noss and Cooperrider 1994, Harris et al. 1996, Wiens et al. 2002, Li and Wu 2004), particularly for habitat specialists like martens and fishers (Bissonette et al. 1997). Habitat that has been fragmented into small patches, or patches that are distant from similar habitat, can be useless to a species and including patches that do not meet the minimal size will inflate calculations of the amount of habitat. Bissonette's chapter on the effects of fragmentation on martens is particularly helpful at explaining this phenomenon. Understanding the basis of the phenomenon is one thing, but conducting an analysis to account for it is		

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	altogether different since it is not straightforward. One must first decide on a metric for fragmentation, for which the software FRAGSTATS is helpful. We have found a number of fragmentation indices in FRAGSTATS helpful in our research (e.g., Kirk and Zielinski 2009, Moriarty et al. in prep.). Unfortunately SPECTRUM does not produce spatially explicit results, so may not be useful to address this problem. Bottom line: calculations about the amount of fisher and marten habitat affected by treatments in WUIs, for example, should consider both the *absolute amount o*f habitat affected as well as the additional effects of fragmentation on the *spatial configuration* of residual habitat."		
92	William Zielinski, p. II-52: "I am not qualified to review the approach to		An open invitation to discuss the SPECTRUM Model to all participants collaborating on the Monument Plan. On July 8, 2008, a meeting was held to discuss how the model worked and to address all questions, including those on the data used and the results.

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	modeling future forest conditions using SPECTRUM (nor future wildlife habitat conditions). However, I strongly suggest that these results be reviewed by an independent entity since many of the conclusions rest on the veracity of these analyses, and the assumptions that must accompany them…the authors' state: "*modeling has shown increases in old growth habitat and in large trees > 30" in the future for all alternatives*". This is hard to reconcile with the fact that, elsewhere in the document, the authors discuss how much habitat for old-growth associated species will be lost under some alternatives…I encourage the forest supervisor and regional forester to make sure that the modeling details are reviewed by a competent peer reviewer, so that they		Selection of an alternative by the deciding official must consider resource trade-offs or unclear risk. Each of the alternatives treats stands for resiliency and protection from drought, insects, disease, and fire. Some of the alternatives that would have the most favorable impacts in the long run, could also have some immediate, short-term impacts on certain species that require dense canopy. The initial effects of treatments that reduce tree densities may last from one to twenty years, depending on location in canopy and plant species involved. The increase in resiliency from these restoration treatments will be accompanied by increases in tree diameters in the remaining trees. See the response to Comment #2 above for more discussion on selection of tree size and responses to treatment.

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	are confident that conclusions, such as the one outlined above, follow directly from the modeling results."		
93	William Zielinski, pp. II-52 to II-53: "…no evidence of a serious cumulative effects analysis in this document… It seems like a bit of a cop out to state that all that is necessary to account for past actions is to characterize "existing conditions" (e.g. pg. 76 and 86 in Specialist Report; pg. 428, Vol. 1). This would appear to lead to a "shifting baseline syndrome" (Pauly 1995) where we continue to degrade the quality of our landscapes and are willing to continue this pattern because each subsequent CEA dismisses the previous degradations as "existing conditions". The result is that we don't respect, or act to reverse, *gradual* declines	Volume I—Chapter 4—Effects on Wildlife and Plant Habitat—Effects on Management Indicator Species Habitat—Cumulative Effects	The Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions." For these reasons, the analysis of past actions in this section is based on current environmental conditions.

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	in environmental conditions."		
94	William Zielinski, p. II-53: "Missing reference to the published work on the recent wolverine observation (Moriarty et al. 2009) and to a paper that published a predictive wolverine habitat model that applies to the Sierra Nevada (Aubry et al. 2007)."	Draft Biological Evaluation for R5 Sensitive Animals—Environmental Effects—California Wolverine Effects	These references were added to the wolverine section of the Biological Evaluation.
95	William Zielinski, p. II-53: "Martens were included as part of the original fisher study on what is now the monument. Reports on the habitats they used, etc. are very relevant site-specific information that should be reference in the DEIS. The reference is Zielinski et al. (1997) and was sent to Robin Galloway and Steve Anderson in the mid-1990s. A pdf is available upon request."	Draft Biological Evaluation for R5 Sensitive Animals—Environmental Effects—American Marten Effects	This reference was added to the Biological Evaluation.
96	William Zielinski, p. II-53: "Any discuss of risk factors to marten should cite the	Draft Biological Evaluation for R5 Sensitive	In northern Utah, martens responded negatively to low levels of habitat fragmentation when the average distance between openings was less than 95 m (317 feet; Hargis et al. 1999). Andren (1994) suggested that as landscapes become

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	abundant literature on their sensitivity to forest fragmentation (details in my general comments above) as well as the recent paper we published that revealed the fragmented nature of marten populations in the northern Sierra Nevada (Zielinski et al. 2005).”	Animals—Environmental Effects—American Marten Effects—Risk Factors	fragmented there is a negatively synergistic combination of increasing isolation and decreasing patch size of suitable habitat that compounds the results of simple habitat loss. For some species, this may result in a decrease of greater magnitude than can be explained solely by the loss of suitable habitat. Marten may be a species that demonstrates this pattern of exponential population declines at relatively low levels of fragmentation (Bissonette et al. 1997). Roads can result in the direct and indirect mortality of individual American marten, as well as the degradation of habitat. Roads can fragment habitat and affect the ability of the animals to use otherwise suitable habitat on either side of the road, and the associated presence of vehicles and humans, can cause animals to avoid otherwise suitable habitats near roads. For example, Robitaille and Aubry (2000) found American martens to concentrate their activity away (greater than 300 m) from roads (although use near roads was not precluded).Vehicular collisions resulting in American marten mortality have been known to occur on the Monument. Most were associated with long paved stretches of road where vehicles tended to maintain higher speeds. In a study conducted on the Lake Tahoe Basin Management Unit and Sierra National Forest, Zielinski et al. (2007) found that marten occupancy or probability of detection did not change in relation to the presence or absence of motorized routes and off highway vehicle use when the routes (plus a 50 meter buffer) did not exceed about 20 percent of a 50 square kilometer area, and traffic did not exceed one vehicle every 2 hours. The study did not, however, measure behavioral changes or changes in use patterns and the study authors caution that application of their results to other locations would apply only if off highway vehicle use at the other locations is no greater than reported in their study.
97	William Zielinski, p. II-53: “The authors overlooked an important paper we	Draft Biological Evaluation for R5 Sensitive	This reference was added to the Biological Evaluation.

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	published on the lack of effects of OHVs on martens in the Sierra Nevada (Zielinski et al. 2007).”	Animals—Environmental Effects—American Marten Effects	
98	William Zielinski, p. II-53: “In regard to fisher, the authors do not cite the work conducted on the Sequoia National Forest (now monument) that described the CWHR types actually used by fishers (our progress reports and Zielinski et al. 2004b). This is an example of local data that is overlooked in favor of generic literature.”	Draft Biological Evaluation for R5 Sensitive Animals—Environmental Effects—Pacific Fisher Effects	This reference was added to the Biological Evaluation.
99	William Zielinski, pp. II-53 to II-54: “The authors’ claim that there is “*some evidence of recent population expansion*” yet the data from the Southern Sierra Population Monitoring Program have not yet been analyzed. This conclusion may end up being correct, but is premature based on the existing science. In fact,	Draft Biological Evaluation for R5 Sensitive Animals—Environmental Effects—Pacific Fisher Effects—Historic and Current Distribution	**Sierra Nevada Population Status and Trend**. Status and trend monitoring for Pacific fisher in the Sierra Nevada was initiated in 2002; the monitoring objective is to be able to detect a 20 percent decline in population abundance and habitat (USDA 2006). This monitoring includes intensive sampling to detect population trends on the Sierra and Sequoia national forests, where the Pacific fisher currently occurs, and is supplemented by less intensive sampling in suitable habitat in the central and northern Sierra Nevada specifically designed to detect population expansion. From 2002–2008, 439 sites were surveyed throughout the Sierra Nevada on 1286 sampling occasions. Pacific fishers have been detected at 112 of 251 (44.6%) sites sampled during the 7 monitoring seasons (Truex 2009). Pacific fishers have not been detected in the northern, central, or eastern Sierra. Preliminary proportions of

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	a careful examination of the data in Table 1 shows that the percent of sample units with detections are actually *less* in the most recent assessment than they were in the beginning, for 2 of the 3 subregions."		number of sample sites with Pacific fisher detections divided by the number of sites surveyed are presented in Table 1. Using future data, the proportions will be adjusted based upon Pacific fisher detectability, potentially resulting in higher annual estimates than those reported here; annual estimates will be used to monitor trend (USDA 2006).
100	William Zielinski, p. II-54: "The authors fail to cite the most current paper on the distribution of carnivores in the Sierra Nevada: Zielinski et al. (2005). This also includes considerable new text on the conservation of martens and fishers that is relevant."	Draft Biological Evaluation for R5 Sensitive Animals—Environmental Effects	This article was cited in the Biological Evaluation.
101	William Zielinski, p. II-54: "Risk factors. It is biased and unbalanced to list roads first, and to overemphasize their effects – based on the published literature. Since the beginning of the era of published literature on fishers in California, timber harvest has been described by almost all authors, as the primary risk factor for	Draft Biological Evaluation for R5 Sensitive Animals—Environmental Effects—Pacific Fisher Effects—Risk Factors	The USFWS (2004) identified major threats to fishers in the West Coast Distinct Population Segment, discussed relative to specified factors for listing under Section 4 of the Endangered Species Act. Only those threats deemed by USFWS (2004) to be "important" to the entire West Coast DPS are summarized in this section. The reader is referred to the Federal Register for the complete USFWS 2004 discussion. ***Factor A. The Present or threatened Destruction, Modification, or Curtailment of the Species' Habitats or Range.*** The extent of past and present timber harvest can fragment fisher habitat, reduce it in size, or change the forest structure to unsuitable for fishers. Both fuels reduction activities and effects of wildfire could result in loss and/or fragmentation of habitat. Development, recreation and roads also pose a threat of habitat loss/fragmentation as well as direct mortality. Research literature

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	fishers. Yes, roads can be a threat as well, but they do not deserve the majority of the text in a short section on Risk factors. The authors should review the current draft of the Interagency Fisher Conservation Assessment to understand the current view on the risk factors. In my understanding of the literature, roads are given way too much credence in the Specialist Report and DEIS and timber harvest – and its effects on resting structures and dense cover – too little."		suggests that the loss and fragmentation of suitable habitat by roads may have played a role in the reduction of Pacific fisher from the central Sierra Nevada and its failure to re-colonize there. ***Factor B. Overutilization for commercial, recreational, scientific or educational purposes***. Historical trapping resulted in a severe population decline. Current mortalities or injuries from incidental trapping even where fisher trapping has been eliminated could be frequent and widespread enough to prevent population recovery or re-occupation of suitable habitat. ***Factor C. Disease or Predation***. There is potential for disease outbreaks to occur in these small, isolated fisher populations with devastating effects. Mortality from predation by mountain lion, bobcat, coyote or large raptors could pose a significant threat to fishers. ***Factor D. The inadequacy of existing regulatory mechanisms***. Some protections are available, but highly variable from jurisdiction to jurisdiction, and limited. Current regulations fail to provide sufficient certainty that conservation efforts will be implemented or that they will be effective in reducing threats to fishers.
102	William Zielinski, p. II-54: "Example of statement without necessary reference: "*Canopy closure retention guidelines for spotted owls and northern goshawks maintain habitat characteristics also preferred by fisher*". Where is the literature citation, or a	Draft Biological Evaluation for R5 Sensitive Animals—Environmental Effects—Pacific Fisher Effects	The intent of PACs for spotted owls and northern goshawks is to maintain canopy cover and large trees. Since those habitat characteristics are also important to fishers, this seems to be a logical, common sense statement that doesn't require a literature citation. The down log standard is from the 1988 Forest Plan.

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	description of the logical arguments that support this conclusion? Another example is on pg. 124 in regard to downed logs. Where is the literature citation for the specific standard: "*Retain approximately 132 cubic feet per acre of well-dispersed down logs. Ideal log size is 20 inches in diameter and 20 feet in length*". Ideal in respect to what, wildlife use (if so, where is the citation?) or in respect to the logistics and practicality of providing such logs?"		
103	William Zielinski, p. II-54: "Exempting WUI defense zone from snag retention is a risk to fisher and marten habitat. The magnitude of this risk could be evaluated using the type of approach represented in the new work by Thompson et al. (in rep.) that, I understand, is also being developed specifically		This is a project-level tool not appropriate for this programmatic-level plan amendment. In addition, this tool was being developed for a project located outside the Monument (C. Thompson, pers. comm.).

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	for the monument (C. Thompson, pers. comm..). This approach uses the expected composition and configuration of female fisher home ranges as a 'reference condition' against which to compare the future condition of treated watersheds or landscapes (or allocations, such as WUIs). Note also, that using this approach to evaluate the effects of a project is a better match to the scale of treatments than using a regional/landscape model like either the CBI model (Spencer et al. 2008) or Davis et al. 2007 (i.e., relevant to text on pg. 144)."		
104	William Zielinski, p. II-54: "Where are the citations to support the statement that using a 8-12" diameter limit would increase fuels, not reduce them? This seems to contradict the synthesis of science embodied in North	Volume I—Chapter 3—Vegetation, including Giant Sequoia Groves—Giant Sequoia Groves and Inventory	Treatments or the combinations of treatments such as mechanical and fire will be a major focus in reducing the excess fuels buildup in the monument. Reduced fuel loads will help make it possible, in later decades, to keep these levels down with treatments that use fire only. The statement commented on was replaced with discussions such as: The greatest concern in most groves is not sequoia regeneration, but the heavy buildup of surface and ladder fuels which could do serious damage to existing

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	et al. (2009). Same could apply to the assertion that treating surface fuels only ("non-logging" alternative) would be insufficient to address fuels. Where are the citations to support these decisions? If they are not based on science, but instead on economics, than this too should be stated."		larger trees. Associated with this is the abundant ingrowth of white fir and incense cedar. These more shade tolerant species reduce the growth of other tree species by using soil moisture and casting shade. They also serve as ladder fuels which could damage or kill the crowns of the largest trees. Tree mortality follows a pattern common in most forests where most dead trees are smaller and suppressed. In 1999 there was an average of 21 standing dead trees per acre over 16 groves. Only 10 percent of these were dominant or larger trees. Similarly, less than 30 percent of the dead, fallen trees were over 24 inches in diameter. The high mortality (42 standing snags per acre) of larger white fir, sugar pine, incense cedar, and black oak in the Mountain Home Grove was most likely due to overcrowding, drought, and insects. Higher mortality such as this can be expected in many groves given the current drought; future predictions that we may see warmer and drier growing conditions; increasingly higher densities of trees; and older ages of pines, oaks, cedars, and firs. Higher tree mortality in groves such as Alder Creek (56 snags per acre) and Mountain Home will likely contribute to a higher fuels loading. Alder Creek and Mountain Home groves in 1999 already had total fuel loads of 92 and 75 tons per acre, respectively. The desired amount of fuel loading for these groves is 31 tons per acre.
105	William Zielinski, p. II-55: "Where are the citations to support the following statement?: "*These management treatments [thinnings]; however would distribute fewer impacts over a larger area, and over a longer period of time, than expected from sudden large and serve wildfires*." Why should we believe	Volume I—Chapter 4—Vegetation, including Giant Sequoia Groves—Cumulative Effects of Alternatives	Citation added to this discussion: Treatments designed to reduce the risk of catastrophic fire to the objects of interest would substantially be completed in the first two decades. Areas that have woody material removed from the site through burning or mechanical methods in more than one entry will experience a cumulative loss in some protective ground cover and forest nutrients. These managed treatments, however, would distribute fewer impacts over a larger area and over a longer period of time than expected from sudden large and severe wildfires. Protection treatments would usually be located in areas that are currently highly susceptible to catastrophic fire or in defense or threat zones around communities and other key resources values. After treatment fire susceptibility would be reduced in these areas, thereby reducing the risk of

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	this? There is no reference to published literature to support this and no reference to analyses that were done to confirm.”		damage from catastrophic fire. In addition, monitoring data indicate that prescribed fire activities in low to mid-elevation mixed conifer/giant sequoia vegetation leads to a 60 to 80 percent reduction in total fuels, measured in tons per acre (USDI 2001).
106	William Zielinski, p. II-55: “A proposed mgmt direction for “Old Forest Habitat” is to “*Mimimize old forest habitat fragmentation*”. This recognizes the negative effect of fragmentation, but none of the analyses in the Specialist Report or the DEIS evaluate the potential effects of the alternatives on habitat fragmentation. Perhaps this will only be done at the project level, but this is only one scale. Fragmentation occurs at a regional, landscape, watershed and stand scales. Methods for assessing changes in indices of fragmentation are well established, but none are mentioned here, – in reference to proposed mgmt direction – or in Vol. 1	Volume II—Appendix A—All Action Alternatives—WILDLIFE AND PLANT HABITAT—Old Forest Habitat	The reviewer is correct that this will be done at the project level. The draft EIS, a programmatic-level plan amendment, does not evaluate the potential effects of the alternatives on habitat fragmentation because they do not include site-specific project proposals that could produce direct effects.

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	where the effects of treatments in WUIs on fisher and marten habitat are evaluated. The authors of this document obviously recognize the threat posed by habitat fragmentation, and the basis in science for this threat, yet it is not analyzed in the DEIS nor are methods for future analysis at the project level described in Vol. 2."		
107	William Zielinski, p. II-55: "'*Biological evaluations should be based on surveys'*. The pre-project, or 'clearance' survey is an antiquated notion for the conservation of at-risk species. The Forest Service has responsibility for maintaining sufficient habitat for at-risk species, regardless of the presence of the species or not. Instead of pre-project surveys, the FS has begun to shift towards regional-scale population monitoring programs for	Volume II—Appendix A—All Action Alternatives—WILDLIFE AND PLANT HABITAT--Furbearers (Fisher and Marten)	This standard and guideline applies only in Alternative E, which follows the requirements of the Mediated Settlement Agreement.

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	fishers and martens (see the "Southern Sierra Fisher Population Monitoring Program"). This is a more accepted approach to inventory and monitoring than the ad hoc system that preceded it. The field of conservation biology realized that pre-project surveys led to the loss of habitat because places where the target species happened to be absent often led to more severe management practices than where the target species was detected, leading to an overall decline in the amount of habitat over time. Because suitable habitat is not often saturated, and populations are not always in equilibrium with their habitat, there will always be some suitable habitat that is unoccupied during a survey."		
108	William Zielinski, p. II-55: "Modeling Overview. Why		These models are not appropriate for use in this programmatic-level analysis. The models require site specificity and will be implemented when a site-specific project is proposed in

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	weren't any of the models for fisher habitat use developed on the Sequoia NF, or that apply to it, considered here? These include Zielinski et al. 2004, 2006; Davis et al. 2007, Truex and Zielinski 2005, Spencer et al. 2008. An effort should be made to link SPECTRUM or FVS with existing empirical models developed from local wildlife habitat models."		the Monument.
109	William Zielinski, pp. II-55 to II-56 : "There are numerous incidents, listed above, where current and relevant literature was not consulted (see, in particular, the sections: "Lack of Citations, In General" and "Missing References to Important Literature"). The authors do not appear to extract sufficient inference, in particular, from the studies conducted on the monument	Draft Biological Evaluation for R5 Sensitive Animals	Additional citations were added to the Biological Evaluation as appropriate.

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	itself (Zielinski et al 1997, Zielinski et al. 2004a,b) nor reference the most current paper on the status of carnivores, and their threats, in the Sierra Nevada (Zielinski et al. 2005). The near final version of the Interagency Fisher Conservation Assessment (= West Coast Fisher Conservation Assessment; WCFCA) has been available for almost a year. There is only one minor reference to this document in the Specialist Report (pg. 87), but this is evidence that the authors had access to it. Two R5 employees – Diane Macfarlane and Rick Truex (on Sequoia NF) were WCFCA team members and could have been consulted. If the assessment had been more thoroughly referenced, some of the issues noted above would not have been a problem. There are also many unsubstantiated		

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	statements that are lacking reference to the literature or to analyses that may have resulted in the conclusions. The section on indirect effects (Vol. 1; pg. 395-411) is especially problematic in this respect."		
110	William Zielinski, p. II-56: "The emphasis on roads as dominant risk factors, compared to timber harvest and vegetation management, is an instance where the central tendency of the literature is ignored. Also, the CBI model (Spencer et al. 2008) is referred to as a potential tool to evaluate the effects of projects, but this is not a recommended function of that model (W. Spencer, pers. comm.)."	Draft Biological Evaluation for R5 Sensitive Animals	The Biological Evaluation was edited to address these issues. See the responses to Comments #78, #96, and #101 above.
111	William Zielinski, p. II-56: "Another example is the general lack of reference to the summary of data represented by North et al. (2009). Statements are made suggesting that the removal		Edits have been made to include more use of this reference in the Vegetation, including Giant Sequoia Groves sections of the documents, as shown in the responses to Comments #1, #69, and #90.

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	of larger trees may be necessary to restore ecological integrity. That this may need to happen on all topographic positions (including north-facing slopes) and in riparian areas represents, in my view, a poor interpretation of the science summarized in North et al. (2009)."		
112	William Zielinski, p. II-56: "Treating 3,000 acres per year (Vol 1., pg. 75, Table 25) is a lot of forest land, especially with an alternative that permits the removal of larger trees (Alt. F), when we don't yet have the science in hand to know the effects on fishers. The uncertainties would be better addressed using simulation approaches, like those advocated by Thompson et al. (in prep.) and Spencer et al. (2008) and by referring to possible positive and negative effects of treatments on important		These are project-level issues that are not appropriate for use in this programmatic-level analysis. They require site-specific analysis and will be addressed when a site-specific project is proposed in the Monument.

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	habitat elements (snags, logs, dense canopy). There are also 2 important ongoing studies on the Sierra NF that will, in a few years, give us a better understanding of the effects on fishers of the types of treatments proposed for the monument. These studies, and their future inferences to management decisions like those considered by the DEIS, should be foreshadowed in the document. Recognizing the current studies and their goals, is another way to acknowledge the uncertainties in our current understanding. In general, I found the documents to contain very few descriptions of the analyses that were conducted and, therefore, very little reference to statistical uncertainty."		
113	William Zielinski, p. II-57: "See, for example, the	Draft Biological Evaluation for R5	The discussions of risk factors were edited to address this concern. See the responses to Comments #96, #101, and #106.

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	description of risk factors and the role of timber harvest (tree removal) versus roads. Also, the effects of forest fragmentation are well known in the conservation science community, yet there does not appear to be any analysis of the effects of fragmentation, nor foreshadowing of plans to use FRAGSTATS, or any other spatially explicit analytical approach, to evaluate the effects of restoration treatments on habitat continuity. All the analysis appears to be based on simple absolute habitat loss and gain arguments, based on non-spatial analysis in SPECTRUM using simple CWHR classifications. This occurs despite an abundance of new science, much of it produced on the Sequoia NF, that is available to address habitat suitability at	Sensitive Animals—Environmental Effects	

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	various scales.”		
114	William Zielinski, pp. II-57 to II-59: Recommended references	Draft Biological Evaluation for R5 Sensitive Animals	These references were reviewed and added to the Biological Evaluation where appropriate.